October 1958
JPH
VOLUME 48 NUMBER 10

AMERICAN Journal of Public Health AND THE NATION'S HEALTH

in all diarrheas

CREMOMYCIN®

SUCCINYLSULFATHIAZOLE—NEOMYCIN SUSPENSION WITH PECTIN & KAOLIN

EXPERIENCE

MORE THAN 16 MILLION DOSES ADMINISTERED WITH SAFETY AND EFFICACY.

regardless of etiology

MSD

MERCK SHARP & DOHME

DIVISION OF MERCK & CO., Inc., PHILADELPHIA 1, PA.

CREMOMYCIN is a trademark of Merck & Co., Inc.

Official Monthly Publication of the American Public Health Association, Inc.

AMERICAN
Journal of Public Health
AND THE NATION'S HEALTH

CONTENTS • OCTOBER 1958
VOL. 48, NO. 10

Articles

PAGE

Arthropod-Borne Encephalitis in the U.S.A. 1307
ALAN W. DONALDSON, SC.D.

Supplementation of Diets with Proteins and Amino Acids 1315
N. W. FLODIN, PH.D.

The Effect of Chlorine in Water on Enteric Viruses 1323
SALLY KELLY, PH.D., AND WALLACE W. SANDERSON

Sampling and Screening Problems in a Rheumatic Heart Disease Case-Finding Study 1335
EDMUND A. GEHAN, PH.D.

The Psychology of Dietary Change 1342
WALTER W. HAMBURGER, M.D.

Psychological Aspects of Obesity in Adolescence 1349
HILDE BRUCH, M.D.

Obesity in the Adolescent 1354
GEORGE H. LOWREY, M.D.

The Role and Use of Codes for Compiling Service Statistics 1359
JOHN J. FREYSINGER, M.B.A., M.P.H., AND F. M. HEMPHILL, PH.D.

Development, Application, and Evaluation of the Wayne County Public Health Nursing Record System, with an Analysis of the Statistical Method Used . 1364
AMALIA G. KRAUSE, R.N., M.P.H., AND IRVIN R. VAUGHN

Continued on page iv

Eighty-Sixth Annual Meeting

American Public Health Association

St. Louis, Mo., October 27-31, 1958

Articles, continued

PAGE

Inquiry Into Diagnostic Evidence Supporting Medical Certifications of Death 1376
IWAO M. MORIYAMA, PH.D.; WILLIAM S. BAUM, M.D.; WILLIAM M. HAENSZEL; AND BERWYN F. MATTISON, M.D.

Applications of Order Statistics to Health Data 1388
BERNARD G. GREENBERG, PH.D., AND AHMED E. SARHAN, PH.D.

Sequential Methods in Clinical Trials 1395
PETER ARMITAGE, PH.D.

Journal Departments

EDITORIALS:

Housing Conservation and Urban Renewal 1403
The Importance of Learning to Crawl 1404

Letter to the Editor 1405
N. E. MCKINNON, M.B.
EDITOR'S NOTE.

Guide for Residencies in Public Health. Formulated by the Residency Review Committee for Preventive Medicine; Approved by the American Board of Preventive Medicine and the Council on Medical Education of the American Medical Association 1407

Association News 1412
Procedures for Adoption of Resolutions Changed. Annual Meeting Information

News of Affiliated Societies and Branches 1413

Employment Service 1418

Books and Reports 1425

Books Received 1427

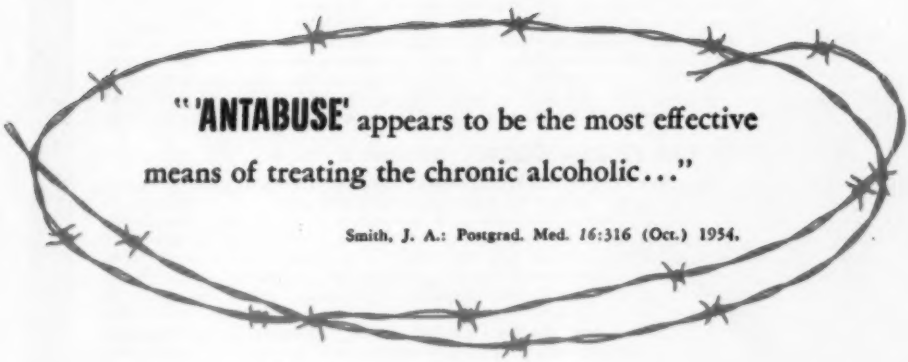
A Selected Public Health Bibliography with Annotations 1428
RAYMOND S. PATTERSON, PH.D.

News from the Field 1431

Conferences and Dates XXIX

The American Journal of Public Health and the Nation's Health is published by the American Public Health Association, Inc., at 374 Broadway, Albany 7, N. Y. Executive office 1790 Broadway, New York 19, N. Y. Subscription price $12.00 per year for United States, elsewhere $13.00 to cover postage and handling. Single copies $1.25 postpaid. Entered as second-class matter at the Post Office at Albany, N. Y., September 17, 1932, under the Act of March 3, 1879. Published monthly. Copyright 1958, by the American Public Health Association, Inc. The American Journal of Public Health is indexed in the Industrial Arts Index and, in part, in the Quarterly Cumulative Index Medicus, Biological Abstracts, Chemical Abstracts, Engineering Index, and Public Affairs Information Service.

Address all correspondence to the Managing Editor, 1790 Broadway, New York 19, N. Y.



A "CHEMICAL FENCE" FOR THE ALCOHOLIC. "Antabuse" helps the alcoholic resist his compulsive craving for alcohol, and enables him "to respond more readily to measures aimed at the correction of underlying personality disorders." Bone, J. A.: J. Nat. M. A. 46:245 (July) 1954.

"Antabuse"® brand of DISULFIRAM (tetraethylthiuram disulfide) is supplied in 0.5 Gm. tablets, bottles of 50 and 1,000.

Complete information available on request

Ayerst Laboratories • New York, N. Y. • Montreal, Canada

5546

A BIBLIOGRAPHY OF INTERNAL MEDICINE *By Arthur L. Bloomfield*

The medical profession has long been in need of a systematic bibliography of communicable diseases. This book admirably fills this need: it is a bibliography of thirty such diseases and attempts to list every important reference to each of them from 1800 to the present. Among the diseases included are tuberculosis, malaria, syphilis, pneumonia, scarlet fever, rheumatic fever, tetanus, meningitis, and cholera. In addition to presenting a list of references, substantial excerpts are included which point up the theses of the material. *$10.00*

CLINICAL EPIDEMIOLOGY *By John R. Paul*

Dr. Paul sets forth a workable and explicit concept of epidemiology—a science concerned with the ecology of disease and with the general circumstances in which sickness flowers. This approach is contrary to the common conception of the epidemiologist who quels disease conflagrations after they have begun; the author provides insights into the multitude of factors influencing disease: immunology, toxicology; social, climatic, political and religious influences. Much emphasis is placed on infectious diseases, but there are ample discussions of such phenomena as coronary heart disease, benzol poisoning, cancer, automobile accidents and suicides. The book presents a new philosophy for epidemiology, and shows its applications to problems encountered in medicine and public health. *$5.00*

At your bookseller or directly from the publisher:
THE UNIVERSITY OF CHICAGO PRESS, 5750 Ellis Ave., Chicago 37, Illinois
In Canada: The University of Toronto Press, Toronto, Ontario

INDEX TO ADVERTISERS

	Page
American Public Health Association:	
Book Service.....XXX, XXXIV,	XXXVI, XXXVIII
Membership Application Blank	XXXIII
Sustaining Members.....	XXXI
American Can Company.....	XXVIII
American Meat Institute.....	XXVI
American Seal-Kap Corp.....	XXXVII
Ayerst Laboratories.....	V
Bristol-Myers	XXXV
Cereal Institute, Inc.....	XX
Chilean Iodine Educational Bureau, Inc.....	XXXVII
Difco Laboratories.....	Back Cover
Directory of Health Service.....	XXXII
Black & Veatch	
Dickman Laboratories	
Roy B. Everson	
Emerson Venable, P.E.	
Professional Examination Service, APHA	
Diversey	XXI
Florida Citrus Commission.....	XIX
Hoffmann-La Roche Inc.....	XXIII
International Equipment Co.....	XII
LaMotte Chemical Products Co.....	XXXIII
Lederle Laboratories Division, American Cyanamid Company.....XVIII,	XXXIII
Lehn & Fink Products Corporation..	XXIV
Leitz, E., Inc.....	XXVII
Lilly, Eli, & Co.....	XIII
Lorvic Corporation.....	VIII
McKesson Laboratories.....	XXXV
Maltbie Laboratories Division, Wallace & Tiernan Inc.....	XXXIX
MD Publications.....	XXII
Merck Sharp & Dohme.....	II
Milwaukee Lace Paper Co.....	XXV
Ortho Pharmaceutical Company....	XV
Oval Wood Dish Corp.....	XXX
Parke, Davis & Co.....	IX
Powers X-Ray Products, Inc.....	XXXII
Professional Tape Company, Inc....	X
Reed & Carnrick.....	XI
Squibb, E. R., & Sons.....	XIV
University of Chicago Press.....	VI
Upjohn Company, The.....	XVII
Wander Company Division of Smith-Dorsey	XVI
Wiley, John, & Sons, Inc.....	XXX
Wyeth, Inc.....	VII

Dialogue from a small patient...

Um-m-m!

BICILLIN®

ORAL SUSPENSION

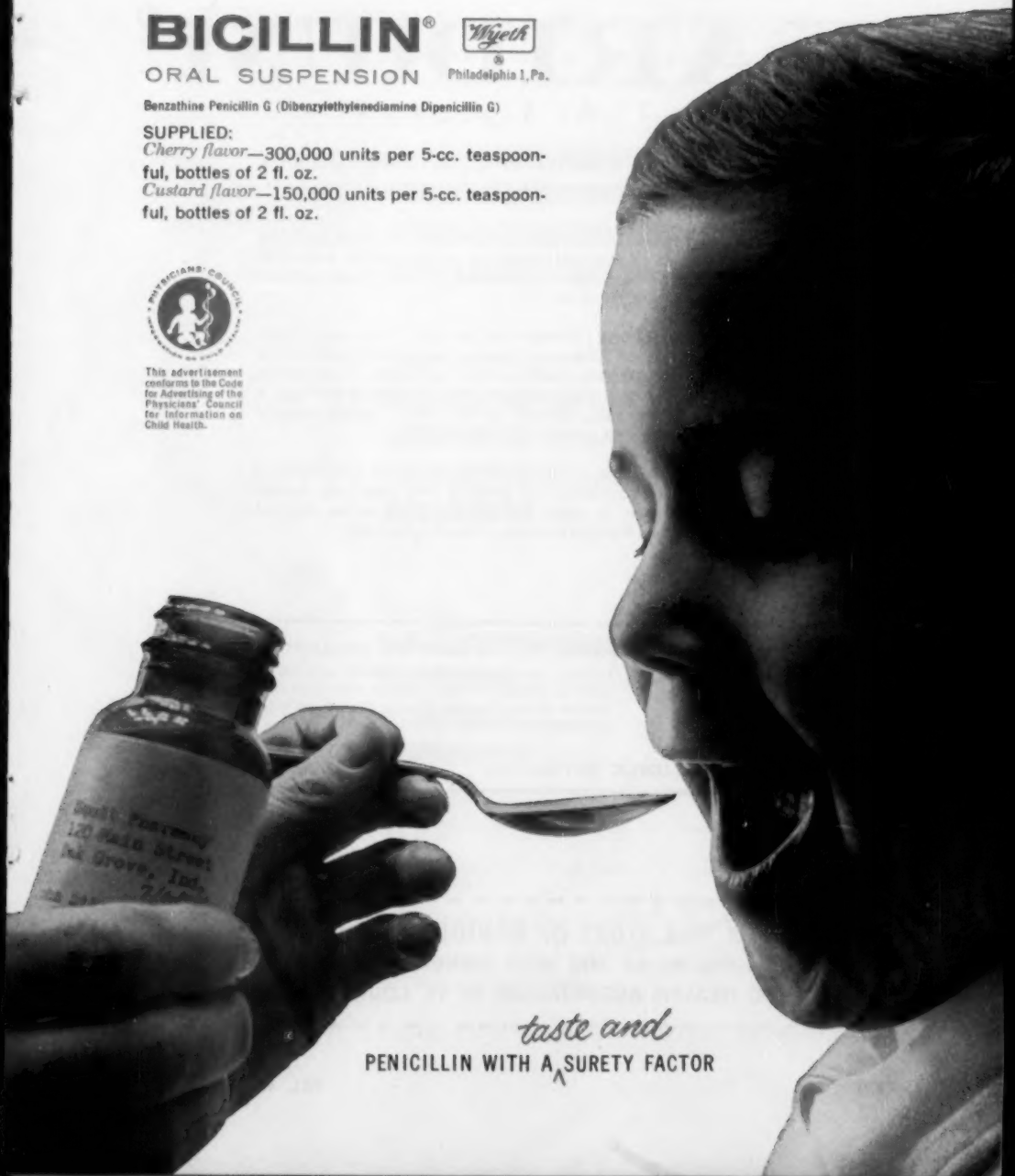
Wyeth
Philadelphia 1, Pa.

Benzathine Penicillin G (Dibenzylethylenediamine Dipenicillin G)

SUPPLIED:
Cherry flavor—300,000 units per 5-cc. teaspoonful, bottles of 2 fl. oz.
Custard flavor—150,000 units per 5-cc. teaspoonful, bottles of 2 fl. oz.

PHYSICIANS' COUNCIL

This advertisement conforms to the Code for Advertising of the Physicians' Council for Information on Child Health.



taste and
PENICILLIN WITH A SURETY FACTOR

Fluoridated Water May Be Unavailable...
But Not The **Benefits** of Fluoridation!

KARIDIUM®

TABLETS

PROVIDE INDIVIDUAL, SYSTEMIC CONTROL OF DENTAL CARIES IN CHILDREN.

Many physicians, dentists, schools and public health institutions are using KARIDIUM. KARIDIUM can provide the benefits of FLUORIDATION where it is unavailable...or where Fluoride content of water supply is too low.

For HOME FLUORIDATION, one tablet in a quart of water provides the recommended Fluoride Concentration:...one part per million. KARIDIUM tablets may also be dissolved in milk or fruit juices or taken as an aspirin. Administered to children and infants in the proper doses, KARIDIUM permits a precise, systemic source of fluoride for the prevention of dental caries.

Chemically pure sodium fluoride is the sole active ingredient in a 1.5 grain tablet. Each KARIDIUM tablet yields 1 mg. available fluoride ion. In infants and young children, caution should be exercised to avoid a daily dose of more than one tablet.

℞ **KARIDIUM IS SOLD ONLY ON PRESCRIPTION!**

Samples, literature and various schedules (precisely computed for variables in age, individual water consumption, Fluoride content of water, climate, etc.) are available to physicians and dentists. Write to:

THE LORVIC CORPORATION **ST. LOUIS 12, MISSOURI, U. S. A.**

FOR THE FULL STORY OF KARIDIUM TABLETS, VISIT OUR BOOTH NO. 94 AT THE 86TH ANNUAL MEETING AMERICAN PUBLIC HEALTH ASSOCIATION IN ST. LOUIS.

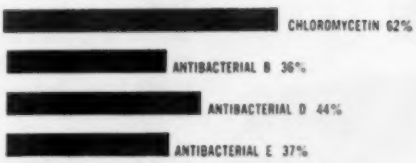
OUTSTANDING
CHLOROMYCETIN®

COMBATS MOST CLINICALLY IMPORTANT PATHOGENS

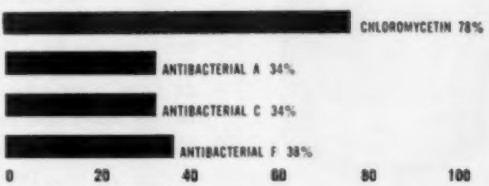
IN VITRO SENSITIVITY OF THREE GRAM-NEGATIVE PATHOGENS TO CHLOROMYCETIN AND TO OTHER WIDELY USED ANTIBACTERIALS*

ESCHERICHIA COLI

AEROBACTER AEROGENES



PROTEUS



*Adapted from Waisbren, B. A.: *Wisconsin M. J.* 57:89, 1958.

The antibacterial agents used in this study are those selected by the author as the ones most likely to be effective.

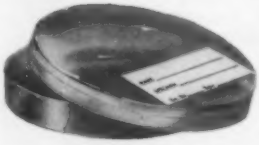
CHLOROMYCETIN (chloramphenicol, Parke-Davis) is available in a variety of forms, including Kapseals® of 250 mg., bottles of 16 and 100.

CHLOROMYCETIN is a potent therapeutic agent and, because certain blood dyscrasias have been associated with its administration, it should not be used indiscriminately or for minor infections. Furthermore, as with certain other drugs, adequate blood studies should be made when the patient requires prolonged or intermittent therapy.

PARKE, DAVIS & COMPANY · DETROIT 32, MICHIGAN

A TIME LABEL

for every laboratory requirement!



It's safe...

SURE and ACCURATE!

TIME self-sticking LABELS are used without wetting. They are fast, safe and provide positive identification with complete safety from hepatitis and other laboratory infections.

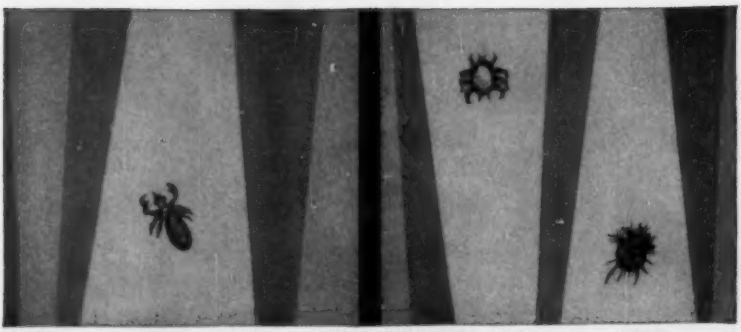
They are excellent for use on microscopic slides, bottles (glass and plastic), radioactive containers, animal cages and hundreds of other laboratory uses. They are moistureproof and resist autoclave temperatures to +250°F. or deepfreeze temperatures to −70°F.

BE SAFE . . . BE SURE . . . use TIME LABELS! Custom labels and color coding are available for specific requirements.

TIME SELF-STICKING LABELS VINYL COATED

Write today for complete detailed literature on the outstanding advantages of TIME LABELS.

PROFESSIONAL TAPE CO., INC.
355 BURLINGTON ROAD · Dept. 41-C · RIVERSIDE, ILL.



KWELL®

GAMMA BENZENE HEXACHLORIDE 1%

new
shampoo

ERADICATES
PEDICULOSIS CAPITIS AND PUBIS
IN 4 MINUTES

"A single shampooing sufficed to eradicate infestation . . . in all cases...in a few minutes."■

Gardner, J.: J. Pediat. 52:448 (Apr.) 1958.

SUPPLIED: KWELL Shampoo: bottles of 2 & 16 fl. oz.

cream & lotion

IN SCABIES,
CHIGGERS AND
PEDICULOSIS

95% to 100% effective in 1 treatment — acts fast — non-irritating — nonstaining. ■

SUPPLIED: KWELL Cream: jars of 2 oz. & 1 lb. — KWELL Lotion: bottles of 2 & 16 fl. oz.

REED & CARNRICK / Jersey City 6, New Jersey

SPIN 1500 ml at 26,000xG

and maintain material temperature at 0° C with

ALL-NEW MODEL HR-1

INTERNATIONAL HIGH-SPEED REFRIGERATED CENTRIFUGE

This unique combination of large capacity, higher speed and lower controlled temperature increases the value of centrifugal force as a basic research tool.

HIGH "G" HEADS: The 8-place 50 ml head delivers **40,000 x G;** the 6-place 250 ml head, **26,000 x G.** Adapters are available for use with smaller tubes. Additional heads and attachments are being developed.

HIGH SPEEDS are obtained by a direct drive, special motor. Speeds are set by a stepless autotransformer control.

TEMPERATURES BETWEEN −20°C and +40°C are kept constant within ±1°C by a 1 HP refrigeration unit, an exclusive fin-coiled evaporator, and a new combination of plastic foam and fibre glass insulation.

USE THE COUPON to get all the facts about this all-new and better high-speed refrigerated centrifuge from **International . . . Your Dependable Source for Centrifugal Force.**

International Equipment Co.

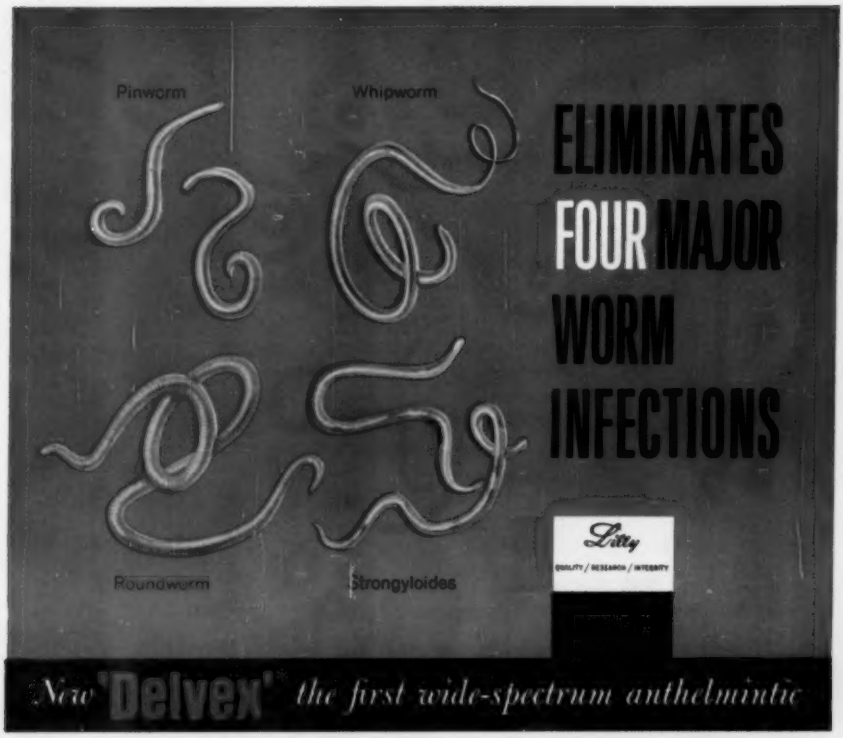
1202 SOLDIERS FIELD ROAD, BOSTON 35, MASS., STadium 2-7900

Please rush complete data, prices and delivery schedules on International's new HR-1 High-Speed Refrigerated Centrifuge.

Name..... Title.....

Institution.....

Street & No..... Zone..... State.....



Clinical studies[1] *show:*

- 'Delvex' is effective orally, usually within five days, against four of the five most common worm infections:

Pinworm	Whipworm
Roundworm	Strongyloidiasis

- It also inhibits, and sometimes eliminates, hookworm infection.
- It is fully effective in both single and multiple infections and in both heavy and light infections.
- It eliminates pinworm infection in 100 percent of patients.
- It is the first effective and practicable agent for the oral treatment of strongyloidiasis and whipworm infection.
- No adjunctive measures are needed with 'Delvex' therapy.

Further information may be obtained from your Lilly representative or by writing to our Medical Department.

*'Delvex' (Dithiazanine Iodide, Lilly)

1. Swartzwelder, J. C., et al.: J. A. M. A., 165:2063, 1957.

ELI LILLY AND COMPANY • INDIANAPOLIS 6, INDIANA, U.S.A.

B4177Z

WHEN YOU TREAT INFECTIONS IN PATIENTS SUCH AS THESE

- debilitated
- elderly
- diabetics
- infants, especially prematures
- those on corticoids
- those who developed moniliasis on previous broad-spectrum therapy
- those on prolonged and/or high antibiotic dosage
- women—especially if pregnant or diabetic

the best broad-spectrum antibiotic to use is

MYSTECLIN-V

Squibb Tetracycline Phosphate Complex (Sumycin) and Nystatin (Mycostatin) — Sumycin plus Mycostatin

for practical purposes, Mysteclin-V is sodium-free

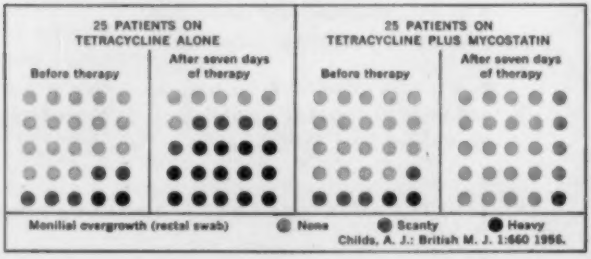
for "built-in" safety, Mysteclin-V combines:

1. Tetracycline phosphate complex (Sumycin) for superior initial tetracycline blood levels, assuring fast transport of adequate tetracycline to the infection site.

2. Mycostatin—the first safe antifungal antibiotic—for its specific antimonilial activity. Mycostatin protects many patients (see above) who are particularly prone to monilial complications when on broad-spectrum therapy.

Capsules (250 mg./250,000 u.), bottles of 16 and 100. *Half-Strength Capsules* (125 mg./125,000 u.), bottles of 16 and 100. *Suspension* (125 mg./125,000 u.), 2 oz. bottles. *Pediatric Drops* (100 mg./100,000 u.), 10 cc. dropper bottles.

MYSTECLIN-V PREVENTS MONILIAL OVERGROWTH

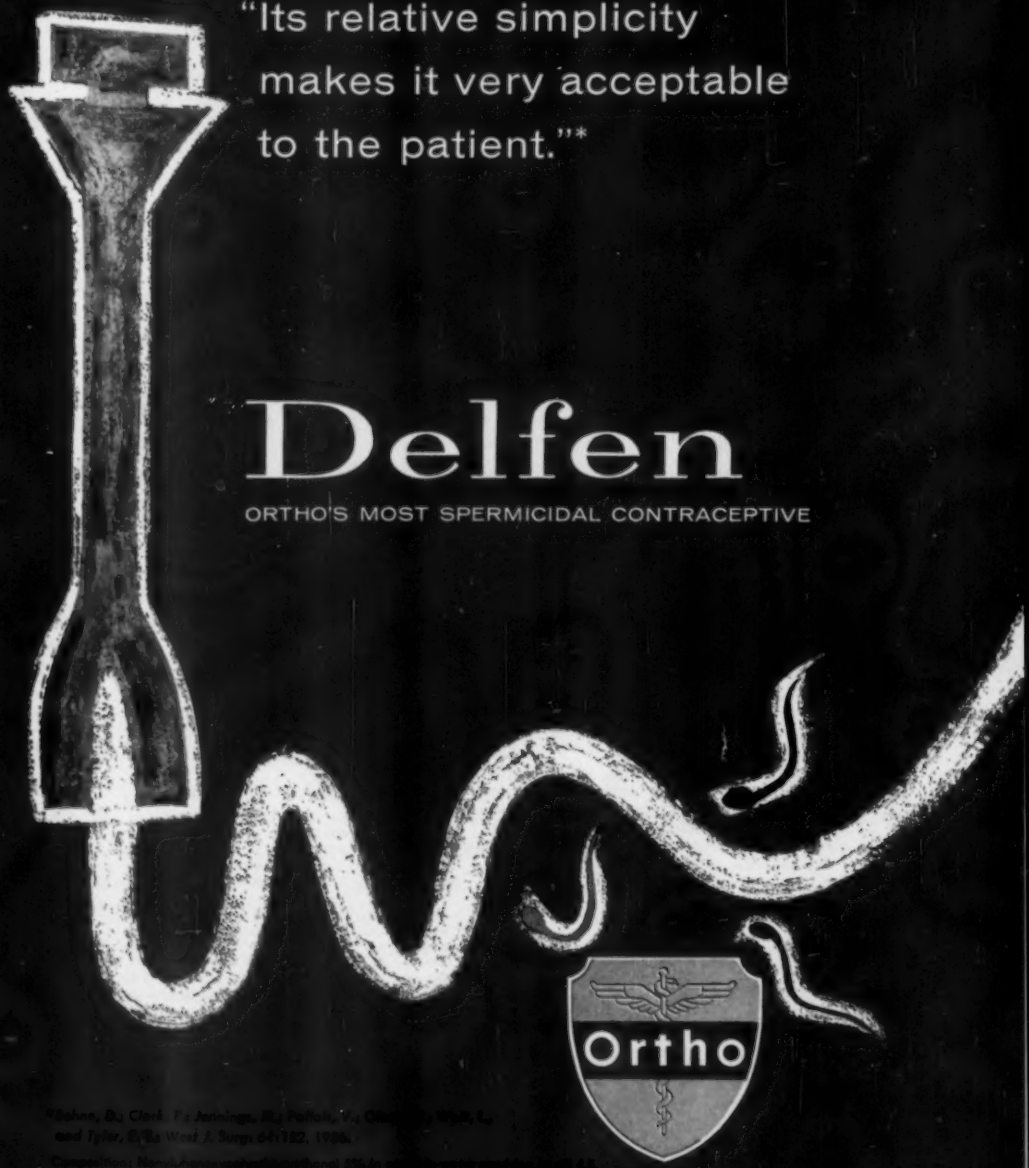


Childs, A. J.: British M. J. 1:660 1956.

SQUIBB

Squibb Quality—the Priceless Ingredient

"MYSTECLIN," "MYCOSTATIN," ® AND "SUMYCIN" ARE SQUIBB TRADEMARKS



*Baker, B.; Clark, P.; Jennings, B.; Pallon, P.; Ob[illegible]; Wyatt, L.; and Tyler, E.: So. Med. & Surg. 64:182, 1956.

Composition: Nonoxynol-9 [illegible]

At any age

they welcome Ovaltine for extra nourishment

From pediatrics to geriatrics Ovaltine provides a rich source of the vitamins, minerals and other essential food elements required for the maintenance of a good nutritional state.

Ovaltine is a nourishing, well-tolerated beverage combining natural blandness with good taste. It produces a soothing and relaxing effect for the tense and nervous patient, particularly when taken at bedtime.

It is ideal for use where stimulating beverages should be avoided...ideal as nutritional fortification for patients on bland diets...or to help maintain a satisfactory nutritional level during physiologic stress.

Three servings of Ovaltine and milk provide:

12 Vitamins		13 Minerals
*Vitamin A	4000 I.U.	including Calcium,
*Vitamin D	420 I.U.	Phosphorus, Iron and Iodine
*Ascorbic acid	37.0 mg.	CARBOHYDRATE	65 Gm.
*Thiamine	1.2 mg.	*PROTEIN	32 Gm.
*Riboflavin	2.0 mg.	FAT	30 Gm.
Pyridoxine	0.5 mg.	
Vitamin B_{12}	5.0 mcg.	
Pantothenic acid	3.0 mg.	
*Niacin	10.0 mg.	
Folic acid	0.05 mg.	
Choline	200 mg.	
Biotin	0.03 mg.	

*Nutrients for which daily dietary allowances are recommended by the National Research Council.

A jar of Ovaltine will be sent for your personal use on request.

Ovaltine® *when extra nourishment is desired*

The Wander Company, 105 W. Adams St., Chicago 3, Ill.

A new way to stretch the public health dollar...

Up to 90% of the cost of insulin injections, given by a public health nurse in the patient's home, is saved when the diabetic patient is switched to Orinase. In one large city, the cost of injections per welfare patient is $2.75 daily, including both the cost of insulin and of the nurse who injects it. With Orinase, the total cost can be reduced to 20¢ or 25¢ a day.

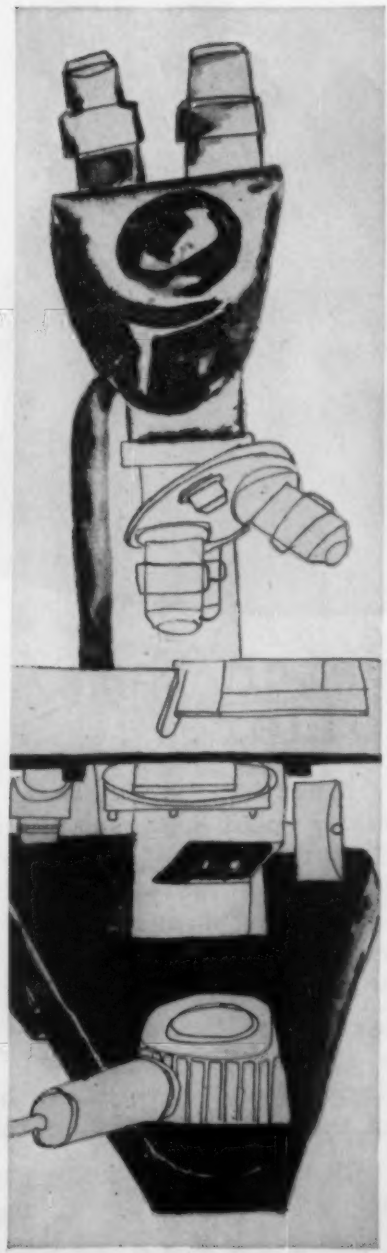
Whenever therapeutic trial is warranted (80% of aged, debilitated, and generally obese diabetics usually respond), Orinase offers physicians excellent control of the patient, and better control of the public health dollar.

*TRADEMARK, REG. U.S. PAT. OFF.—TOLBUTAMIDE, UPJOHN

Upjohn

THE UPJOHN COMPANY, Kalamazoo, Michigan

ORINASE*



PRODUCTS for LABORATORY MEDICINE prepared and tested according to the highest standards

AGENTS FOR CLINICAL USE:

BLOOD GROUPING, Rh TYPING, and ANTI-HUMAN (Coombs Test) SERUMS, NIH-approved.

BLOOD CULTURE MEDIUM.

E. COLI TYPING SERUMS.*

FEBRILE ANTIGENS. For rapid slide test screening purposes—for both somatic and flagellar Salmonella (including Typhoid and Paratyphoid infections), as well as for other fevers of undetermined origin.

SALMONELLA GROUPING and TYPING SERUMS.*

(See also Febrile Antigens above.)

SHIGELLA GROUPING SERUMS.

SYPHILIS ANTIGENS: V.D.R.L.; Kahn Standard (Dr. Kahn Laboratory-approved); Laughlen Reagent (Dr. Laughlen Laboratory-approved).

PASTEURELLA TULARENSIS TUBE ANTIGEN.

VIRAL AND RICKETTSIAL ANTIGENS.

*Prepared according to CDC Methods and standards

AGENTS FOR LABORATORY USE

LYMPHOGRANULOMA VENEREUM SKIN TEST ANTIGEN and CONTROL.

TRICHINELLA EXTRACT and SALINE CONTROL.

TUBERCULIN PATCH TEST (Vollmer).

For further information contact the Lederle representative through your hospital pharmacy or write:

LEDERLE LABORATORIES DIVISION, AMERICAN CYANAMID COMPANY
PEARL RIVER, NEW YORK

Lederle

in the season of

acute infections, extra

CITRUS

provides the increased

VITAMIN C

and fluid needed during

FEVER

to prevent deficiency and

help maintain resistance*

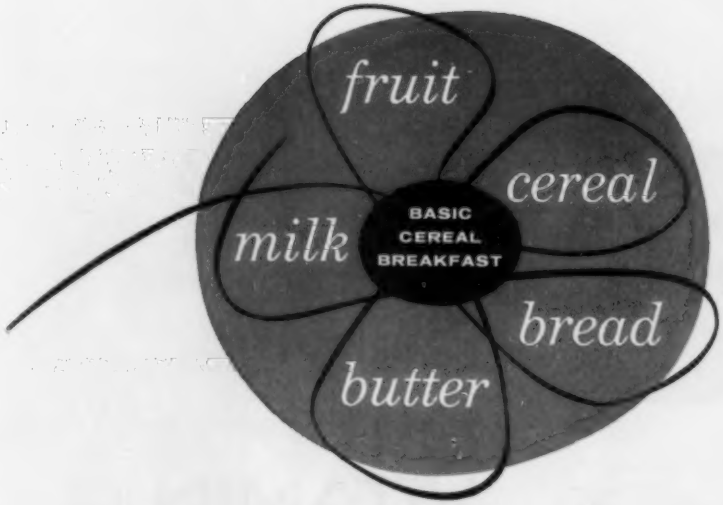
*Tisdall and Jolliffe note the systemic relation in animals between vitamin C and resistance to infection, with increased needs evident in upper respiratory streptococcal infections.

– In: Clinical Nutrition ed. by Norman Jolliffe et al. New York, Paul B. Hoeber, Inc., 1950, pp. 590-91, 637-38.

Florida Citrus

ORANGES • GRAPEFRUIT • TANGERINES

FLORIDA CITRUS COMMISSION • LAKELAND, FLORIDA



this moderately *low-fat* breakfast is a well-balanced meal

When a moderate reduction of the fat calories is to be recommended in the morning meal, the basic cereal and milk breakfast merits your consideration because it is moderately low fat and contributes well-balanced nourishment as shown in the table below.

The Iowa Medical College Breakfast Studies demonstrated that this basic cereal and milk breakfast, contributing about 20 gm. high quality protein, provided quick and lasting energy during the early and late morning hours and maintained mental and physical efficiency.

basic cereal breakfast pattern

Orange juice, fresh, ½ cup,
Cereal, dry weight, 1 oz.,
with whole milk, ½ cup, and sugar, 1 tsp.,
Bread, white, 2 slices, with butter, 1 tsp.,
Milk, nonfat (skim), 1 cup,
black coffee

Nutritive value of basic cereal breakfast pattern

CALORIES	502	VITAMIN A	660 I.U.
PROTEIN	20.5 gm.	THIAMINE	0.46 mg.
FAT	11.6 gm.	RIBOFLAVIN	0.80 mg.
CARBOHYDRATE	80.7 gm.	NIACIN	3.0 mg.
CALCIUM	0.532 gm.	ASCORBIC ACID	65.5 mg.
IRON	2.7 mg.	CHOLESTEROL	32.9 mg.

Note: To further reduce fat and cholesterol use skim milk on cereal which reduces Fat Total to 7.0 gm. and Cholesterol Total to 16.8 mg. Preserves or honey as spread further reduces Fat and Cholesterol.

Bowes, A. deP., and Church, C. F.: Food Values of Portions Commonly Used. 8th ed. Philadelphia: A. deP. Bowes, 1956.
Cereal Institute, Inc.: The Nutritional Contribution of Breakfast Cereals. Chicago: Cereal Institute, Inc., 1956.
Hayes, O. B., and Rose, G. K.: Supplementary Food Composition Table. J. Am. Dietet. A. 33:26, 1957.
Cereal Institute, Inc.: A Summary of the Iowa Breakfast Studies. Chicago: Cereal Institute, Inc., 1957.

CEREAL INSTITUTE, INC. 135 South LaSalle Street, Chicago 3
A research and educational endeavor devoted to the betterment of national nutrition

Draw on Diversey's experience in every conceivable phase of sanitation

Bottlewashing . . . can washing . . . cleaning and disinfecting HTST units . . . pipelines . . . holding tanks . . . spray cleaning vacuum pans and evaporators . . . mechanized cleaning of tank trucks . . . milkstone removal and prevention . . . insect control . . . and on and on the list goes. In every phase of sanitation you will find Diversey's diversified service and technical "know-how" can work for you to maintain high product quality.

The pioneering work Diversey has done in these fields is almost legendary. In the dairy farm field, Diversey worked with the public health authority of a large dairy state to develop the first accepted techniques and products for pipeline cleaning in place. They were the first to develop a complete bottlewashing compound that also controls scale. First again with color-coding of compounds to prevent mix-ups.

Diversey's 35 years of experience in sanitation is made available wherever food is processed or served. Each of the over 200 trained D-Man representatives will be happy to assist you on sanitation problems.

DIVERSEY.

1820 ROSCOE STREET, CHICAGO 13, ILLINOIS

1923 35 YEARS OF 1958

RESEARCH PROGRESS SERVICE

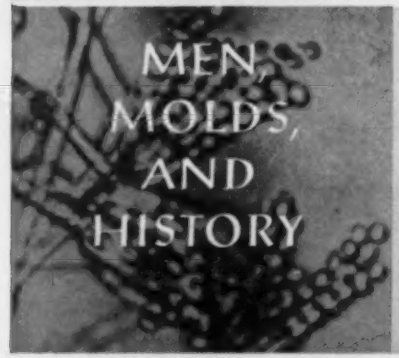
2 NEW BOOKS

of outstanding medical distinction and significance

CENTAUR: Essays on the History of Medical Ideas
by Félix Martí-Ibáñez, M.D. **720 pages, $6**

The historical pageant of medicine
—in its full dimensions
—with its ultimate concept

The scope of this book is truly broad, not being limited by era or geography. Here are articles on the development of medicine in Don Quixote's Spain; William Harvey as a student in gay Padua; the influence of atomic science on modern art; the riddle of curare; the role of books and writing in the physician's life; the turbulent, bloody world of the artist-physician during the Renaissance; the psychology of Oriental rug symbols; the evolution of contemporary psychobiology; and many other notable and intriguing topics.



MEN, MOLDS, AND HISTORY
by Félix Martí-Ibáñez, M.D. **128 pages, $3**

The new world of antibiotics
—its over-all meaning in science
—its total impact on society

The history, present status, and probable future of antibiotics are presented with originality and profound insight, and their effects on science and civilization are shown with dramatic sweep. Among the subjects covered are: the search for the broad-spectrum antibiotics; important, related aspects of clinical medicine, general scientific research, medical education, and public health; the background of the clinical case history; words and medical communication; the relation of antibiotics to the art of translation; and others.

SPECIAL COMBINATION OFFER

MD PUBLICATIONS, INC.
30 East 60th Street, New York 22, N. Y.

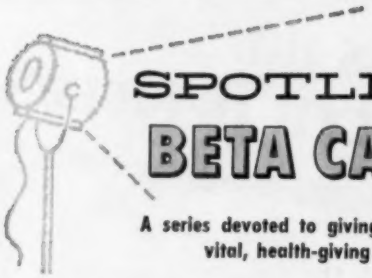
Please send_____copies of Centaur: Essays on the History of Medical Ideas ($6)
and_____copies of Men, Molds, and History ($3)
— or send both books at the special combination offer of $8.

☐ *Bill me.* ☐ *Check enclosed.*

NAME _____
INSTITUTION _____
ADDRESS _____
CITY _____ STATE _____

These two books, a panorama of the men, ideas, events, and places that made history, reflect the striking philosophical viewpoint of Félix Martí-Ibáñez, M.D. The author's colorful life enables him to think as a psychiatrist, historian, author, and soldier *malgré lui*. He has lived and extensively traveled in four continents, and has worked with dedication and achievement in the humanities and sciences, always maintaining his quest for the decisive messages of medical humanism and continuing his search for his own inner truth. At present, in addition to his writing and publishing, Dr. Martí-Ibáñez is Professor and Director of the Department of the History of Medicine, New York Medical College, and Editor-in-Chief of the medical newsmagazine, MD.

Beautifully designed in an unusual format and finely bound in durable cloth, both books are eminently readable and make a worthy addition to any library.



SPOTLIGHT ON BETA CAROTENE

A series devoted to giving you brief facts about those vital, health-giving factors — the vitamins.

BETA CAROTENE, *One of the Newer Phrases You see on Food Package Labels.* More and more processors are using beta carotene — the safe, true carotene yellow color — to make their good foods bright, appealing, and more nutritious.

. . . Of all the carotenoids now known, beta carotene is the most useful for human beings because of its value as a provitamin A. Not all carotenoids are provitamins.

Beta carotene is a safe color. It is one of nature's own coloring agents. It has been consumed in foods for thousands upon thousands of years. It is an acceptable coloring for foods in the U. S. A., Great Britain, Switzerland and other countries around the world.

Beta carotene is now used as a safe, natural yellow coloring agent in such foods as margarine, shortening, lard, butter, cheese, salad and cooking oils, confections, yellow baked products, beverages, ice cream.

The text above has been taken from the newest Roche publication: "The Story of Nature's Yellow — Beta Carotene." If you have not yet read this interesting and informative brochure, or if you wish to distribute copies to your associates, please send your request to the Vitamin Division. You will not be charged or obligated.

If you are engaged in the manufacture of foods or pharmaceuticals, our technical service is at your disposal . . . in confidence, of course.

VITAMIN DIVISION • **HOFFMANN-LA ROCHE INC.** • NUTLEY 10, N. J.

Roche Research and Roche Products Preserve and Protect the World's Health

ROCHE ROUND THE WORLD

AFFILIATED COMPANIES: BASLE • BOGOTA • BRUSSELS • BUENOS AIRES • GRENZACH • HAVANA JOHANNESBURG • LONDON • MADRID • MEXICO CITY • MILAN • MONTEVIDEO • MONTREAL • PARIS RIO DE JANEIRO • STOCKHOLM • SYDNEY • TOKYO • VIENNA • AGENCIES IN OTHER COUNTRIES

SPECIAL MESSAGE TO PUBLIC HEALTH OFFICERS

Now that you are confronted with the immediate need to take prompt and positive action to combat cross infections in hospitals, may we help you? Here are three ways we can -

1) If you are helping the hospital set up a standing committee to study the problem, we can supply supplementary information to aid in analyzing the problem.

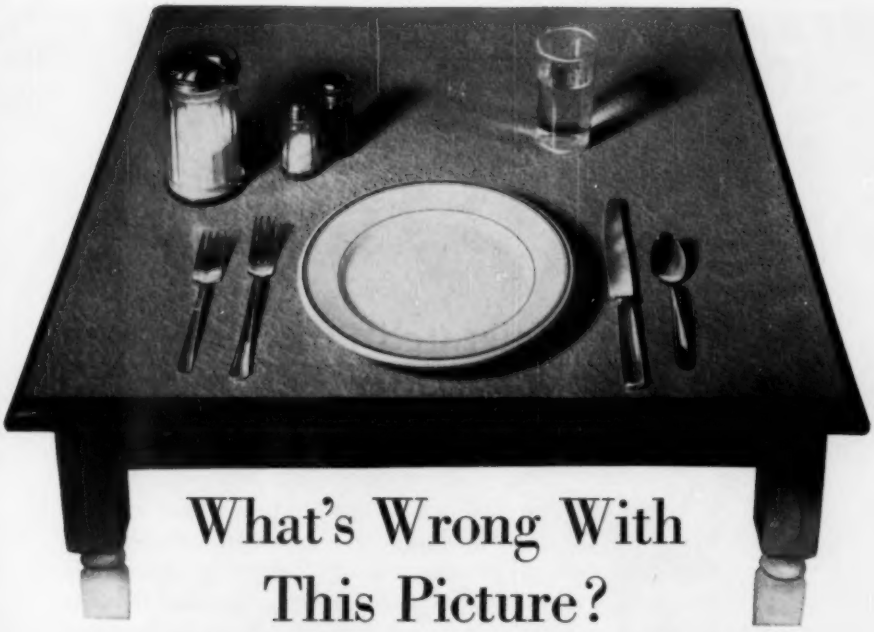
2) If you are working with the committee in identifying trouble spots and establishing methods for stopping outbreaks and reducing incidence, we can suggest hospital-tested disinfection technics for each area of the hospital.

3) If you are recommending control procedures and overseeing their observance, we can provide practical methods for increasing disinfection procedures without creating a financial burden for the hospital.

(Our new detergent-disinfectant, called TERGISYL,™ is an important weapon here. It has all the proven germicidal effectiveness of the phenolics plus greater detergency than many cleaning products used alone. Comparative time studies show that TERGISYL™ reduces the man-time required for washing and disinfecting floors by 47%.)

Please call on us. Product literature and samples are available, as well as the assistance of our technical staff, if you wish.

Professional Division
LEHN & FINK PRODUCTS CORPORATION
445 Park Avenue, New York 22, N. Y.



What's Wrong With This Picture?

Looks harmless enough!

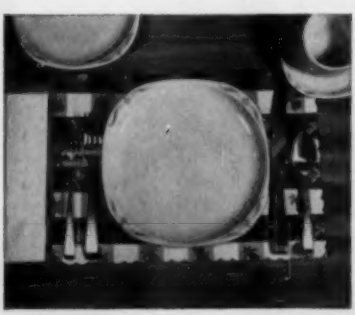
But that bare table top — hopefully wiped 'clean' with a damp cloth or sponge — poses a threat to public health that's as real as it is widespread.

In a well-documented survey* conducted recently by one of America's leading universities, it was proved that the uncovered table top harbors an extensive microbial population . . . that it is a potential disease-carrier (particularly of respiratory and gastro-intestinal infections).

Serious as it is, however, the risk of 'table-top contagion' can easily be overcome. One of the most effective ways is through the use of disposable table settings like Milapaco paper place mats and doilies. Always fresh and snowy-white, Milapaco settings *look* as invitingly clean as they really *are*. And what more economical way to 'dress up' a table! No costly wear and tear! No laundry or storage problems! No expensive replacements!

Milapaco paper products come in several sizes and in a variety of printed, plain, embossed and lace patterns. Your nearest wholesale paper distributor carries the complete Milapaco line. Check him today, or fill out coupon for samples and information.

**A copy of this report is yours for the asking. Check coupon below.*



Milwaukee Lace Paper Co., Division of Smith-Lee Co., Inc.
1306 E. Meinecke Avenue, Milwaukee 12, Wisconsin

Please send me without cost or obligation:

☐ Samples of Milapaco paper products
☐ A copy of the University report

My name is .....

Address .....

City ..... Zone ..... State .....

For Speedier Return to Normal Nutrition

Meat...

for Well-Tolerated Protein In Infectious Hepatitis

A well-balanced, liberal diet—high in protein and calories, but moderate in fat—appears to shorten convalescence in uncomplicated infectious hepatitis.* Current opinion recommends that the patient be encouraged to consume between 1.5 and 2 grams of protein and 40 to 45 calories per kilogram of body weight daily.

Meat functions in several important ways in the dietary management of infectious hepatitis. It supplies large amounts of well-tolerated protein, and it makes meals attractive and appetizing, an inducement to adequate eating in the presence of anorexia.

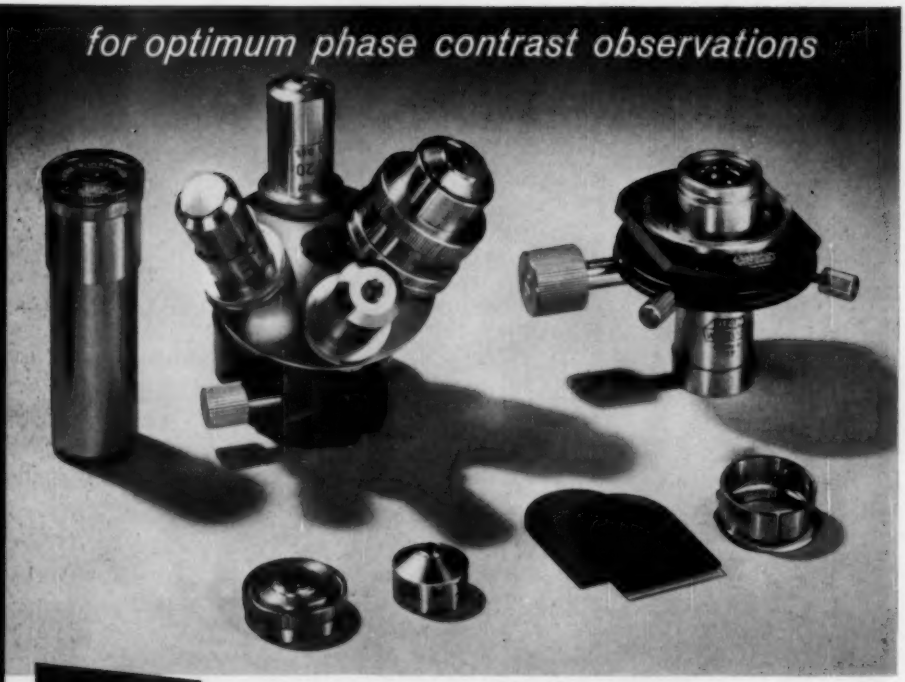
During the initial stage, when the appetite is especially poor, one of the most acceptable sources of high quality protein is *broiled* ground lean beef. One authority* recommends broiled ground beef three times daily. (Each 3.5 ounces supplies approximately 30 grams of protein.) With the recovery of appetite, other attractively prepared meats also are served.

Meat also helps assure an adequate intake of B vitamins, as well as iron, phosphorus, potassium, and magnesium.

*Kark, R. M.: Nutritional Aspects of Liver Disease in Man, in Wohl, M. G., and Goodhart, R. S.: Modern Nutrition in Health and Disease, Philadelphia, Lea & Febiger, 1955, pp. 597-606.

The nutritional statements made in this advertisement have been reviewed by the Council on Foods and Nutrition of the American Medical Association and found consistent with current authoritative medical opinion.

American Meat Institute
Main Office, Chicago...Members Throughout the United States



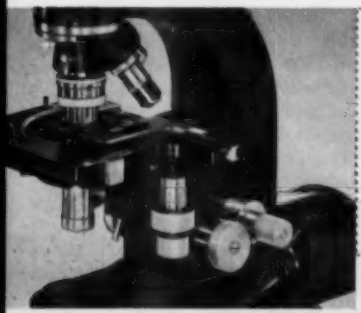
Leitz **PHASE CONTRAST** *equipment*

Without staining and without specimen destruction the differentiation of fine structural details is in many instances made possible only by viewing microscopic objects with Leitz PHASE CONTRAST.

Only Leitz PHASE CONTRAST Equipment with the unique Heine condenser permits instantaneous and continual transition from bright field to phase contrast and to dark field. Use of polarizing filters with PHASE CONTRAST permits observation of anisotropic effects.

Within seconds this transition is easily performed by turning the condenser knob, thus changing the light path as required and permitting comparative study of structures visible in phase contrast with those seen under bright or dark field.

Leitz PHASE CONTRAST Equipment can be used with any microscope. The Leitz DIALUX, as illustrated, with Leitz PHASE CONTRAST Equipment is an ideal combination.



E. LEITZ, INC., Dept. PH-10
468 Fourth Ave., New York 16, N. Y.

Please send me the PHASE CONTRAST Equipment brochure.

Name_____

Street_____

City_____ Zone_____ State_____

09055

E. LEITZ, INC., 468 FOURTH AVENUE, NEW YORK 16, N. Y.
Distributors of the world-famous products of Ernst Leitz, Wetzlar, Germany
CAMERAS • LENSES • MICROSCOPES • BINOCULARS

At simulated altitude of 40,000 feet, this pilot is enjoying a ham dinner. He fits a plastic nozzle to a tube and pushes it through an aperture in his helmet to his mouth. To eat, he merely squeezes the tube.

A NEW squeeze-tube method for feeding our men in space suits has been developed in the American Can Company laboratories.

Several thousand food-filled tubes are now undergoing rigorous performance tests by the Nutrition Section of the Aero Medical Laboratory at the Wright Air Development Center, Dayton, Ohio. The tubes contain 12 different liquid and semi-solid foods of high caloric density, formulated by the Quartermaster Food and Container Institute for the Armed Forces, Chicago.

In designing the tubes, scientists of Canco and Sun Tube Corporation, a subsidiary, had to produce a lightweight container strong enough to withstand food sterilization processes. The aluminum squeeze-tube and its auxiliary "pontube" feeding mechanism eliminate previous defects of high-altitude feeding caused by pressure differences inside and outside the space helmet.

Through the work of skilled scientists, effective research facilities, and the cooperative efforts of industry and government organizations, another advance is being made in mastering the space age.

CANCO **AMERICAN CAN COMPANY**

Journal of Public Health

Arthropod-borne encephalitis is an important health problem in the United States. The nature of the problem, the needs arising from it, and the action to be taken are discussed here.

ARTHROPOD-BORNE ENCEPHALITIS IN THE U.S.A.

Alan W. Donaldson, Sc.D.

IN THE United States there are three arthropod-transmitted viral encephalitides of primary importance—western equine encephalitis, eastern equine encephalitis, and St. Louis encephalitis. In addition, there is a distinct possibility that other as yet uncharacterized or unknown types may occur. When countries other than our own are considered, a variety of diseases must be added, including Venezuelan equine encephalitis, Japanese B encephalitis, Murray Valley encephalitis, louping-ill, and Russian spring-summer encephalitis, along with a substantial number of viruses whose specific relationship to human disease has not yet been definitely established.[1] When considered all together, therefore, sheer numbers of viruses and the diseases they cause make the arthropod-borne encephalitides a complex and somewhat formidable subject. This complexity is compounded further by the fact that, like many other insect-borne infections, the epidemiology of these encephalitides is singularly involved. Thus, in attempting to determine and understand the factors which permit the maintenance of these viruses in nature and allow their transmission to man, we must consider not only the host-parasite relationships between man and virus but also the relationships which exist between virus and vector and between the vector and man.

The complete story for any one of the arthropod-borne encephalitides cannot yet be told, although research studies by investigators both in this country and abroad are adding increasingly to our understanding of these infections. Rather than attempt a detailed report of these research activities it seems more appropriate to take an over-all look at the encephalitides paramount in the United States today, considering three major questions: what is the problem; in terms of the problem, what are the needs; and, finally, what should be our approach at federal, state, and local levels?

The Problem

How important are the arthropod-borne encephalitides? The public health

importance of any disease may be measured by several yardsticks—the clinical severity of the disease, the extent to which the country is involved, and the frequency of occurrence in the population.

In this country the three types of arthropod-borne encephalitis viruses produce acute inflammatory diseases of short duration, involving parts of the brain, spinal cord, and meninges.[1] The signs and symptoms of infection with arthropod-borne encephalitis run the entire gamut from a clinically inapparent infection, through a mild nonspecific syndrome of headache, fever, and malaise, to the fatal case with steady progression from headache, fever, and stiff neck up to lethargy or confusion, stupor, coma, and death. In most cases, recovery is complete, but some individuals, particularly young children, may be left with sequelae of mental retardation, convulsive seizures, spasticity, or milder evidence of neurologic damage. Mortality in apparent infections ranges from 5 to 75 per cent and is highest in infants and the aged. No specific treatment is known for any of them.

With regard to distribution, the three infections are endemic in a number of areas.[2] Western equine encephalitis occurs in all of the states west of the Mississippi River and extends eastward into Wisconsin and Illinois; in addition, isolated occurrences have been reported in Michigan, Kentucky, Tennessee, Alabama, North Carolina, New Jersey, and Rhode Island. St. Louis encephalitis has a similar distribution west of the Mississippi River with important extensions eastward into Illinois, Indiana, Ohio, Kentucky, and Tennessee. Eastern equine encephalitis, the rarest of the three, occurs principally along the Atlantic and Gulf States from Massachusetts to Texas with isolated occurrences reported in Tennessee, Wisconsin, Michigan, Kansas, and Missouri. Taking all three types together, a distribution map would involve essentially the entire country with the exception of northern New England. Even in those states it is possible that virus activity might be demonstrated in reservoir hosts. In 1956 alone, these virus infections were demonstrated conclusively in 25 states in man and horses, in their natural reservoir in wild birds, and/or in the various species of mosquitoes which transmit them, and in all but eight or nine of the remaining states there was strong presumptive evidence of the presence of at least one of these viruses. In 1957 so far, virus activity has been demonstrated conclusively in at least ten states and presumptively in at least nine of the remaining states.

By two of the measures, then, these diseases may be considered important—for they can cause serious illness, sometimes fatal, sometimes with permanent sequelae, and they are widely distributed in this country. But how many people are affected? It is important to emphasize here that part of our problem lies in defining the prevalence of these diseases accurately. The arthropod-borne encephalitides are indistinguishable clinically from other types of encephalitis. Differentiation from nonparalytic poliomyelitis, postinfection encephalitis following measles or mumps, postvaccinal encephalitis, and other encephalitides of viral or undetermined etiology frequently can be made only by careful observations backed up by laboratory confirmations. Up to now, these laboratory confirmations have not been obtained for the majority of cases (except in connection with special studies in limited areas) so that our nationally reported cases of arthropod-borne encephalitis are included along with all the others under the heading "acute infectious encephalitis," with no differentiation attempted as to etiologic agent. Thus, the NOVS reported figures of approximately 2,000 or more cases of acute infectious encephalitis each year

since 1952 give no real indication of the occurrence of the arthropod-borne types. Equally important in trying to interpret the nationally reported cases of acute infectious encephalitis is the factor of underreporting and nonreporting of mild or inapparent infections with the arthropod-borne types.

Since 1955 the Communicable Disease Center, through its Encephalitis Surveillance Program, has been attempting to define more sharply the occurrence of these three diseases in this country by contacting state and territorial health departments to verify further and add pertinent information to data collected from the reports of NOVS and from other sources. In addition, medical and veterinary laboratories performing diagnostic tests for the viral encephalitides have been requested to furnish any information they might have. Information obtained in this program is made available to interested persons in periodic Encephalitis Surveillance Reports.

In 1955 it was obvious that the arthropod-borne encephalitides were not in undue prevalence in the United States. Eastern equine encephalitis occurred sporadically in man but widely in horses and pheasants throughout the Atlantic and Gulf States. St. Louis encephalitis occurred in epidemic form in two areas of the country, the larger occurrence being in the lower Ohio River Valley—constituting an extension of distribution near areas where it had been previously recognized. The reported prevalence of western equine encephalitis was markedly diminished during the year as evidenced by the paucity of cases in man and horses.

There was considerable variation in the prevalence of these diseases in 1956. Eastern equine encephalitis returned in typically miniature epidemic form in southeastern Massachusetts, where only 12 cases occurred although eight of these were fatal. Although the disease was wide in occurrence in horses and pheasants up and down the Atlantic and Gulf Coast from Massachusetts to Louisiana, only three other human cases were reported—in Maryland and Delaware. Western equine encephalitis again affected man in a sparse and sporadic fashion, but accumulated information on the distribution of virus activity demonstrated its presence and therefore its continuing threat to the irrigated areas of the West. There were a number of endemic foci of St. Louis encephalitis, the largest being in the high plains of Texas and a large urban epidemic in Louisville, Ky.

To date, 1957 has been relatively light for all three types. Confirmed activity of eastern equine encephalitis occurred only in Gulf States although serological testing may have revealed a few animal infections in Massachusetts. Western equine encephalitis appeared sporadically in the Mountain States, California, Texas, and North Dakota, while Denver, Colo., and Cache Valley, Utah, both had fairly heavy virus activity. St. Louis encephalitis occurred in Texas in the one major outbreak known to us so far, but virus activity was noted in Florida, Kentucky, Colorado, and California. Final reports, including laboratory data, have not been received from many of the states so that the total over-all picture for the current year cannot be accurately determined at this time.

Even with the most liberal interpretation of the data available, it is obvious that the cases of arthropod-borne encephalitis cannot compare numerically with many of the other communicable diseases. Still, from the standpoint of health departments in the areas where they occur, these three infections have a rather special significance. The very nature of the disease with its greatest severity in children, the somewhat frightening terminology of "sleeping sickness" commonly employed by the press, the often explosive nature of an outbreak or epidemic, and the general

lack of knowledge in the population-at-large concerning these infections, all result in a public clamor that "something be done" when cases occur. Whether it is right or wrong is not for me to argue at this time, but the fact remains that one death from encephalitis in a community will result in a far greater disturbance and public outcry than the ghastly total of deaths from week-end accidents on the highways. This means pressures, sometimes unwarranted, on health agencies—federal, state, and local. Another aspect of importance which must be involved in program planning of health departments in endemic areas is the continuing potential threat of epidemics. Since the classic epidemic in St. Louis in 1933, there have been at least 20 recognizable outbreaks of one of these diseases—usually with no advance warning.

Although opinion may vary as to the relative public health importance of these three infections in comparison with other communicable diseases, we can state almost unequivocally that at present they are the most important vector-borne diseases in this country. So let us consider some of the other aspects of the problem.

One of these has been referred to earlier, namely, that the epidemiology of these infections is complex and variable —probably the most complicated of any of the insect-borne diseases—and a number of factors remain to be fully elucidated. Basically, the arthropod-borne encephalitides in this country appear to be infections (usually inapparent) of wild birds with transmission from bird to bird being accomplished primarily by certain species of mosquitoes.[3, 4] Under certain conditions—whatever these may be—this bird-mosquito-bird cycle is broadened to permit the virus to spill over into the human and domestic animal populations. Although a number of species of mosquitoes have been found either naturally infected or susceptible to experimental infection in the laboratory,[5, 6] evidence is strong that in the western and west central United States, Culex tarsalis is the principal vector of western equine encephalitis and St. Louis encephalitis, while in the central United States, St. Louis encephalitis appears to be transmitted by members of the Culex pipiens-quinquefasciatus complex, particularly in urban situations. Although Culiseta melanura is a strong suspect as the vector of eastern equine encephalitis, at least in terms of the bird-mosquito-bird cycle in nature, the primary vector of the eastern type to man and horses remains to be determined.

There are certain other things we do know, or about which we can make educated guesses. In the first place, both man and the horse appear to be "dead-end" hosts in terms of maintaining the cycle. Viremia in both is apparently so low as to prevent mosquitoes which feed on them from becoming infected.[7] Second, even though certain species of mosquitoes can be easily infected in the laboratory under experimental conditions, these species are not considered to be important in the natural cycle because of their host-preferences for feeding.[6] In other words, a mosquito which does not feed on birds could hardly be an important link, either in maintaining the infection in birds or in transmitting it to man. Mosquitoes which feed solely on birds may serve to maintain the infection in the birds but would not be involved in transmitting it to man or horses. It appears likely that for the arthropod-borne encephalitides, as for malaria, we shall be justified in considering species control rather than all-out mosquito control.

Beyond the issue of the primary vectors, many intriguing questions remain to be answered about the natural history of these infections. Either virus of one type or another has been isolated from a large number of species of wild

birds or serological tests have indicated its presence, and yet we cannot state categorically that one or the other of these birds is the principal reservoir for a given virus. How is the cycle reestablished each summer—by overwintering of the virus in either the mosquito or the reservoir or both, or by its reintroduction into this country in migrating birds? Can the virus remain latent in birds for substantial periods of time, only to be reactivated by some type of stress? Is the pattern of survival of the virus in nature the same or different for all three encephalitis viruses—or even for the same virus in different parts of the country?

Another major aspect of the over-all problem is one already mentioned—that of a definitive diagnosis based on laboratory tests. This has been—and to a certain extent, still is—the primary bottleneck in the appraisal of the public health significance of these diseases, in the carrying on of field epidemiological studies of the types just mentioned, in the adequate investigation of epidemic situations, and in the careful evaluation of control measures in terms of their effect on virus activity in a given area. The difficulty involves the complexity and expense of currently available diagnostic methods. Fortunately, more and more state health department laboratories are undertaking to provide virological diagnostic services so that ultimately laboratory coverage should become available to essentially all endemic areas instead of a selected few.

Another element which must be considered in the over-all situation is the rapid expansion of irrigation practices in connection with the water resources development program of the federal government. If preventive measures are not incorporated into the irrigation projects, the flooding of large acreages will inevitably lead to increased mosquito production in many of these projects. In areas of the West and Midwest this means vastly increased production of Culex tarsalis, currently accepted as being the most important vector of both western equine encephalitis and St. Louis encephalitis in this part of the country. Consideration must also be given to the development of resistance to insecticides by a number of arthropods of public health importance. Included in the list of some 40-odd species of insects of public health importance reported to be resistant to one or more insecticides are 19 species of mosquitoes.[8] Of these, both Culex pipiens and Culex tarsalis are known to be resistant in certain areas of the United States. The tremendous increase in suburban living, along with greater participation by increasing numbers of people in outdoor recreational activities, may bring certain elements of our population into closer contact with ecological situations which favor the transmission of the viruses from the natural reservoirs over to man.

The Need

Many of the needs become almost self-evident in an expression of the problem and a listing of all things which need to be done would assume considerable magnitude. For purposes of discussion, therefore, it is convenient to group these needs into four major categories.

Continuing Appraisal of the True Public Health Importance of the Arthropod-Borne Encephalitides—Without accurate and current morbidity and mortality data classified etiologically, without complete knowledge of the geographic distribution of the etiologic agents, without reliable measures of levels of endemicity, a clear-cut explanation of the present public health importance of the arthropod-borne encephalitides in this country is not possible. This has definite implications in terms of program planning and funding, and in the long-range appraisal of the effectiveness of control activities which might

be employed. Information of the following types should be obtained and appropriate portions maintained on as current a basis as possible: morbidity and mortality data nationally and by state and region, for human beings and animals, for all three types of virus; extent and significance of acute illness; extent and significance of sequelae from both apparent and inapparent infections; economic implications in terms of human illness and effect on domestic animals and birds; and the relationship of these diseases to nonhealth programs and activities such as water resources development projects, recreational areas, and agricultural pursuits.

Comprehensive Understanding of Epidemiology—Although studies in recent years have clarified some of the factors involved in the complicated epidemiology of these encephalitides, much of the detailed work has been restricted to relatively limited areas. We recognize that all assumptions which might apply to these areas cannot simply be extended to other areas where adequate epidemiological studies have not been made. Our ability to develop and establish effective control measures and to reasonably predict the occurrence of epidemics of any one of the three viruses in this country will depend upon the clarification of epidemiological factors on a broader geographical basis. For each of the viruses, then, this would involve a definition of principal and secondary vectors from bird to bird and from bird to man and animal, qualitative and quantitative vector studies, qualitative and quantitative reservoir studies, detailed studies on endemic situations, and complete characterization of epidemics and outbreaks including a determination of the factors contributing to such situations.

Improved Diagnostic Tools, Procedures, and Resources—Adequate and accurate laboratory services are essential to almost every aspect of an encephalitis program, regardless of the level at which it is carried on, both to determine the presence and type of encephalitis virus and to differentiate arthropod-borne encephalitides from other clinically similar diseases. Laboratory diagnostic facilities for the encephalitides have been relatively limited in the country at large, especially for detailed studies. Certain of the currently employed tests are complicated, expensive, time-consuming, and, in some cases, require reagents which are not readily available. Serological response to infection and the persistence of antibodies have not been adequately evaluated. There is need, therefore, for the development, improvement, and evaluation of diagnostic tools and methods, both for virus isolation and for serological determinations; appropriate reagents must be standardized and made available; technics suitable for mass surveys would be very helpful.

Development of Effective and Practical Methods of Control—Although mosquito control is accepted generally as a logical approach to the control of encephalitis, important limitations and deficiencies in our knowledge preclude the current, wide-scale application of this measure. Although certain aspects of conventional and proved methods of insect control for vectors of other diseases may be applicable, varying ecological characteristics of the vectors of encephalitis certainly will require the development and testing of additional technics. It may be that to be practical and effective, different vector control procedures will have to be used in different parts of the country, and these may vary under endemic and epidemic conditions. Control methods directed toward other than the mosquito vector must also be considered, tested, and evaluated. These would include such things as the evaluation of the feasibility and desirability of protection by immunization of man, particularly for selected populations at high risk, and the determination of pos-

sible control effects directed toward the reservoir hosts.

The Approach

What activities should be carried on at federal, state, and local levels to meet these needs? Obviously some of the activities should be carried on at all three levels; others are perhaps more appropriate for one or the other.

In regard to the appraisal of the public health importance of the encephalitides, it seems quite fitting that the federal government should maintain an over-all national surveillance program related to these diseases. This is being done at present by the Communicable Disease Center and will be continued and strengthened where possible. In addition, it would be highly desirable for individual states in endemic areas to establish programs comparable to the excellent one of California and others being undertaken by some of the states in the lower Ohio River Valley. Investigations of epidemic situations appropriately are carried on at the state and local level—most successfully, we believe, when a team approach is used, involving physicians, veterinarians, entomologists, and engineers, all backed up with adequate laboratory support. In certain instances, assistance may be provided from federal agencies.

Detailed epidemiological studies of the types outlined above frequently cannot be supported at state or local levels, especially if they are established on a long-term basis. Investigative programs of the types carried out at some of the field stations of the Communicable Disease Center provide one mechanism for obtaining this type of information. Special studies by university groups represent another. However, there are numerous epidemiological studies which can and should be carried on at the state level, and at times, even at the local level. One of the important studies of this type is a continuing observation of mosquito populations with particular attention being directed to unusual build-up of a known vector population. With information of this type supplemented by evidence of virus activity, it may be possible to predict and to take measures to avert epidemic situations.

The investigative activities indicated in the field of evaluating and improving diagnostic methods can be carried on at both federal and state levels, particularly as the state health department laboratories take on and broaden their virological service.

Control operations are primarily a responsibility of the state and local agencies, although the Communicable Disease Center will provide technical advice and consultation and even emergency aid upon request. In connection with control activities—and this applies equally to investigations—a well informed public is almost a necessity. In a recent conference on St. Louis encephalitis, an engineer representing one of the Ohio River Valley states emphasized that effective mosquito control involves long-term preventive measures and that these must be supported by the local community. Although the fundamental work for the development of safe and effective vaccines might well be considered a project for federal or university research teams, the application of this tool would again be a primary responsibility of state and local health agencies. The same philosophy would apply either to control measures directed toward the reservoirs or to control measures which involve some other modification of the environment to achieve a disturbance of the ecological balance of these viruses.

Conclusion

The arthropod-borne encephalitides in this country are of sufficient public health importance to merit serious con-

sideration. Further, there is every reason to believe that, provided with the necessary epidemiological information, effective and practical control methods can be developed for these diseases as they have been for malaria, typhus, and other arthropod-transmitted infections. Those who are acquainted with Reeves's presentation seven years ago on this same subject will have recognized in this discussion many of the ideas and philosophies which he expressed at that time.[9] Although the excellent work of Reeves and his group in California, the studies of our Public Health Service personnel, and the activities of state and local people have all added to our knowledge during these seven years, Reeves's basic recommendations still hold good now as they did then and I can do no better than reiterate them: (1) evaluate your problem; (2) if a problem exists, learn all you can for your area; (3) in terms of your own situation, do what is indicated in the way of prevention and control; and (4) educate the public.

REFERENCES

1. Olitsky, Peter K., and Casals, J. "Viral Encephalitides," in Viral and Rickettsial Infections of Man (2nd ed.). Edited by Thomas M. Rivers. Philadelphia, Pa.: Lippincott, 1952. Chap. 11, pp. 214-266.
2. Alexander, E. Russell, and Murray, Walter A., Jr. Surveillance of Arthropod-Borne Encephalitis in the United States—1956. Pub. Health Rep. 1958. (In press.)
3. Hammon, W. McD., and Reeves, W. C. Recent Advances in the Epidemiology of the Arthropod-Borne Encephalitides. A.J.P.H. 35:994-1004 (Oct.), 1945.
4. Schaeffer, M., and Arnold, E. H. Studies on the North American Arthropod-Borne Encephalitides. I. Introduction. Contributions of Newer Field-Laboratory Approaches. Am. J. Hyg. 60:231-236 (Nov.), 1954.
5. Chamberlain, R. W.; Corristan, E. C.; and Sikes, R. K. Studies on the North American Arthropod-Borne Encephalitides. V. The Extrinsic Incubation of Eastern and Western Equine Encephalitis in Mosquitoes. Ibid. 60:269-277 (Nov.), 1954.
6. Chamberlain, R. W.; Sikes, R. K.; Nelson, D. B.; and Sudia, W. D. Studies on the North American Arthropod-Borne Encephalitides. Quantitative Determinations of Virus-Vector Relationships. Ibid. 60: 278-285 (Nov.), 1954.
7. Kissling, R. E.; Chamberlain, R. W.; Eidson, M. E.; Sikes, R. K.; and Bucca, M. A. Studies on the North American Arthropod-Borne Encephalitides. II. Eastern Equine Encephalitis in Horses. Ibid. 60:237-250 (Nov.), 1954.
8. Simmons, S. W. Communicable Disease Center Research Developments in Mosquito Control. Proc. and Papers 25th Ann. Conf., California Mosq. Cont. A, Inc. 25:42-46 (June), 1957.
9. Reeves, W. C. The Encephalitis Problem in the United States. A.J.P.H. 41:678-686 (June), 1951.

Dr. Donaldson is assistant chief, Communicable Disease Center, Public Health Service, U. S. Department of Health, Education, and Welfare, Atlanta, Ga.

This paper was presented before a Joint Session of the Conference of Municipal Engineers, the Conference of State Sanitary Engineers, the Inter-American Association of Sanitary Engineering, and the Engineering and Sanitation Section of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 15, 1957.

Protection Against Radioactivity

"Safe Handling of Bodies Containing Radioactive Isotopes (A Guide for Surgeons, Pathologists, and Funeral Directors)" presents pertinent information for the guidance of mortuary and medical personnel involved in the handling and autopsy of bodies containing radioactive materials. The recommendations are those of the National Committee on Radiation Protection and Measurements of the National Bureau of Standards Handbook 65, U. S. Department of Commerce, Supt. of Documents, Washington 25, D. C., 15 cents.

Another NBS publication is an eight-page supplement to "Maximum Permissible Radiation Exposure to Man." This addition summarizes the latest recommendations of the National Committee on Radiation Protection.

Lack of high-efficiency protein in the diet results in deleterious effects on health and work output. Means of improving protein efficiency in the human diet are now available and this knowledge must be applied. The what and the how of this problem are considered here.

SUPPLEMENTATION OF DIETS WITH PROTEINS AND AMINO ACIDS

N. W. Flodin, Ph.D.

The Problem: Low-Protein Efficiency

WE ARE all familiar with the terms "high-quality" and "low-quality" as applied to proteins. For the purposes of this presentation, the terms "high-efficiency" and "low-efficiency" will be substituted, because these are much more descriptive of the true nutritional differences between these classes of proteins.

A high-efficiency protein is simply one that gives, when fed to an animal or a human being, a relatively high yield of tissue protein as measured by growth or nitrogen retention. Examples are the proteins of meat, fish, milk, and eggs. Per unit weight, these proteins consistently show an efficiency two or three times greater, in terms of standard animal growth measurements, than the proteins in most vegetable foods such as the cereal grains.[4]

The efficiency of a protein is governed primarily by its pattern of essential amino acids, that is, the proportions of these nutrients relative to one another.[11] The nonessential amino acids can be synthesized from metabolic intermediates if they are not present in the right proportions in the dietary protein, but we must take the essential amino acids as we find them in our food. Figure 1 shows the difference in amino acid proportions between a high-efficiency protein (egg) and a low-efficiency protein (wheat protein in white flour). The white flour protein has an inefficient amino acid pattern because the proportion of lysine is too low. Other high-efficiency proteins have patterns quite similar to that of egg. Low-efficiency proteins are typically low in one or sometimes two or three essential amino acids.

Nutritional Effects of Low-Efficiency Proteins

Over the years we have carried out many experiments to compare the effect of high and low-efficiency proteins on the nutritional welfare of animals. One study involved life-span observation of laboratory rats on a diet consisting of bread containing 6 per cent nonfat dry milk, supplemented with vitamins, minerals, and a source of essential fatty acids.[8] This diet provided about 12 per cent of its calories from protein, and the protein was about 85 per cent vegetable (wheat) and 15 per cent animal (milk).

Many human beings in underdeveloped areas have no better diets than this. The amount of milk protein in this diet is not enough to lift the protein value out of the low-efficiency classification.

The addition of a quarter-pound of L-lysine monohydrochloride to 100 pounds of the flour used in making this bread raises the protein efficiency of this diet to a level similar to that of the animal protein, casein. We therefore compared another group of animals on the same diet with supplementary lysine. In this way we were comparing the effects of diets that were identical except with respect to the quality or efficiency of their protein. The results are most illuminating when we compare our findings with observations on human beings living on comparable diets in various parts of the world.

First, the animals on low-efficiency protein were retarded in bone growth and total body growth. They exhibited irritability, anorexia, and perverted appetite or pica. The animals matured at a later age than those on high-efficiency protein, and their adult size was distinctly subnormal in comparison with the lysine-supplemented group or with animals on a standard mixed laboratory feed. The lysine-supplemented rats grew and developed normally.

The males were much more adversely affected by the low-efficiency protein diet than the females, both in growth rate and final adult size. The females slowly approached normal adult weights and successfully bore and reared litters. However, their offspring were much below normal size at weaning, indicative of reduced production of milk. The longevity of the male animals was severely affected. Almost all of them had died before the females had ceased bearing litters. No adverse effect was noted on the longevity of the females.

Vohra and Kratzer have reported that, in black rats, sesame-based diets providing sufficient protein for good, though

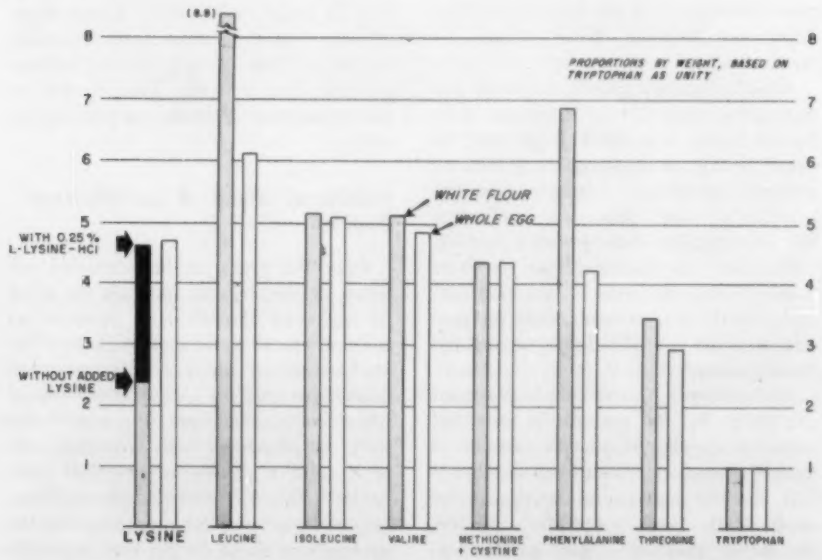


Figure 1—Amino Acid Proportions in Egg and White Flour Protein

not optimal, growth, produced hair coats lighter in color and finer in texture than normal.[21] Lysine supplementation corrected this condition. In our own studies with wheat-based diets containing various proportions of milk and other high-efficiency proteins, up to 40 per cent of the total protein, we have observed changes of texture and loss of luster in the hair of young albino rats. These were correctible with lysine supplementation of the wheat protein in their diets.

A further significant observation that we have made on rats receiving diets adequate in quantity of protein but relatively low in lysine is that they characteristically show a reduced level of voluntary activity. Allison has also observed this in dogs, noting that those fed wheat gluten are inactive by comparison with those fed milk or egg proteins.[2]

It is interesting to compare these observations with those made on human beings living on diets poor in high-efficiency protein. Like the laboratory animals, they show, in infancy, subnormal weights at weaning, and in childhood, retarded growth and bone development. Anorexia, peevishness, apathy, hair changes, and pica are common. Adult size is small.

It is not only in acute protein deficiency of childhood, or kwashiorkor, that the adverse effects of low-efficiency protein become manifest. For example, in Newfoundland, where a large part of the daily protein intake is derived from white flour, Metcoff and co-workers found in 1944 that both women and children were often apathetic and that the children especially were inactive and quiet.[16] In 1948, after enrichment of the flour with B-vitamins, iron, and bone meal, and after greater prosperity had generally improved the average Newfoundland diet, Aykroyd and co-workers found that apathy, while reduced in prevalence, was still observed.[17] Reduced activity has also been found characteristic of American children suffering from mild degrees of protein deficiency,[15] and Stearns and co-workers state that ample good quality protein must be provided children if they are to attain normal muscle development and display normal physical activity.[20]

The problem of disease resistance was not touched in our life-span study. Our animals were reared and maintained with the advantages of modern sanitation. However, other investigators have established that low quantity and efficiency of dietary protein is a major factor in lowering the resistance of laboratory and farm animals to pathogens. Protein deficiency is believed to play a large part in the high mortality rates observed in technically underdeveloped parts of the world.[1] Johnston has found ample intakes of good protein to enhance the resistance of adolescents to tuberculosis and rheumatic fever.[14]

It is fortunate that the female of the species possesses an inherent toughness that enables her to propagate her kind despite adversities of diet. However, there are no grounds for complacency here. Enough is known about the importance of protein in pregnancy to conclude that mothers, and even more their offspring, will be much better off if they receive high-efficiency rather than low-efficiency protein in their diets.[7]

Low-efficiency proteins, in addition to being poor nitrogen sources for growth and development, are also inferior for the maintenance of a vigorous state of health in the adult. Our bodies are made up for the most part of rather stable proteins, for example, the structural proteins of muscle, bone and connective tissue, whose rate of breakdown and replacement is rather slow. A small, but extremely important part of body protein consists of enzymes and proteins found in the blood, liver, pancreas, intestinal walls and other tissues, having high turnover rates. These are called the labile protein reserves, and upon

them, according to Allison, depends the high plane of metabolism characteristic of a vigorous healthy organism.[3]

The pool of body proteins may be likened to the following model, shown in Figure 2. The labile protein reserves, while small in amount, require relatively large amounts of dietary protein for their maintenance. The work of Allison has demonstrated convincingly that high-efficiency proteins are much more effective than low-efficiency proteins in maintaining adequate labile reserves.[3]

When the efficiency or quantity of dietary protein is low, the labile reserves are depleted and the metabolic rate goes down.[14] Caloric needs go down correspondingly, and the organism may in fact be too poorly equipped with enzymes to convert larger intakes of calories into physical work. At any rate, it is characteristic of human beings in underdeveloped regions of the world that their calorie intakes are low by comparison with individuals receiving adequate high-efficiency protein.[9] Although shortage of food is frequently an important factor in these low caloric intakes, it may well be that these people will not be capable of utilizing larger intakes, and thereby producing more work, until the protein bottleneck in their diets has been removed.

Our animal experiments suggest that, by improving the protein efficiency of poor diets, we may be able to break the vicious circle of poor diet-low work output-low food production-poor diet and conceivably produce a large upsurge in the productivity of individuals and countries. If so, this would be the greatest economic incentive we could have for making strenuous efforts to improve protein efficiency. Certainly extensive studies should be launched in the immediate future to determine with precision the manner in which human work capacity is affected by the quantity and efficiency of the dietary protein.

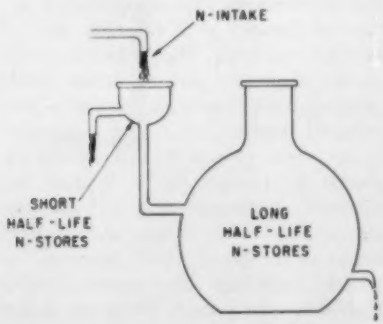


Figure 2—The Pool of Body Proteins

Methods of Improving Protein Efficiency

How are we to raise the efficiency of protein in our diets? There are three principal ways. The first is to supplement a low-efficiency protein with another protein whose amino acid pattern is complementary, so that each tends to make up the other's deficiencies. The second is to add man-made amino acids to the low-efficiency protein. The third method is to use both protein supplements and amino acids simultaneously.

The third method appears to be the most logical one in that it would make the greatest possible use of available foods and then apply amino acids to the function of developing the full protein potential of the combination. An example of this is found in poultry nutrition in the United States. Feed manufacturers scientifically blend a variety of ingredients to obtain good protein efficiency and then finally add to each ton of feed a pound or so of the limiting amino acid (methionine, in this case, because of the large amount of soy protein present) to obtain best results.

It is not so easy to apply this method in human nutrition, as we are dealing with dietary habits and food preferences that are hard to change. The local agricultural economies may not permit generous production of the supplementary

proteins needed. There may be only one or two supplementary foods that can be used, in contrast with the variety of protein sources available to the American feed manufacturer. This makes it probable that man-made amino acids are destined to play an even more important role in human diets than in farm animal feeds.

Figure 3 shows how these principles can be applied to an important dietary staple, bread. This chart summarizes animal feeding studies carried out by ourselves and also by independent researchers at Purdue University and in England.[18, 12, 13, 6] These various studies, all correlated here, were carried out under comparable conditions with supplementary vitamins, minerals, and essential fatty acids.

Although these studies were done with bread, they represent a cross-section of many human dietary patterns since they include diets containing from as little as 10 per cent to as much as 40 per cent of their protein from sources of good amino acid balance, such as nonfat dry milk, lactalbumin, yeast, and soy protein. Most countries of the world would consider themselves fortunate if they could obtain 40 per cent of their protein from such sources.

With these ingredients, in combination with wheat, the limiting amino acid in the diets was lysine. The protein efficiency ratio, or grams weight gained by the animals divided by the grams of protein consumed, is therefore a direct function of the percentage of lysine in the protein, as shown by the curve. The protein efficiency ratio of most vegetable proteins is in the range of 1.2 ± 0.5, while that of most animal proteins, including meat, fish, milk, and cheese, is in the range of 2.5 ± 0.5. Egg protein is somewhat higher, in a class by itself.

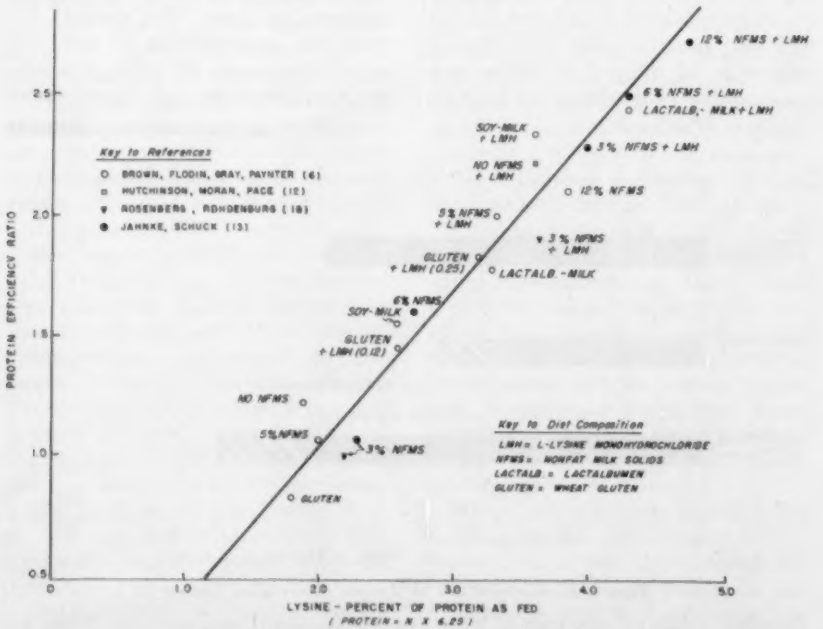


Figure 3—Relation of Bread Protein Quality to Lysine Concentration

This chart shows that breads containing 85–90 per cent wheat protein and 10–15 per cent milk protein have a protein efficiency ratio of around one. Addition of substantial amounts of milk solids, lactalbumin, dried yeast and soy, up to a point where 30–40 per cent of the protein is from these sources and 60–70 per cent from wheat, raises the PER to 1.5–1.8. Addition of lysine to these protein-formula breads increases their PER to about 2.5, thus bringing them into the middle of the animal protein efficiency range.

The amount of lysine added in these studies, incidentally, one-quarter pound of the monohydrochloride per 100 pounds of flour, is just about sufficient to restore the amount of available lysine that is lost from whole wheat in milling to white flour and baking into bread (see Figure 4). The protein of whole wheat grain contains 2.7 per cent lysine. This is reduced to 1.9 per cent by milling to refined white flour,[5] and the nutritionally available lysine is still further reduced to 1.5 per cent by baking into bread, owing to the browning reaction in the crust.[19] Addition of the recommended amount of lysine restores the percentage of nutritionally available lysine to 2.8 per cent of the wheat protein in bread. This follows the restoration principle established in the enrichment of white flour with B-vitamins and iron.

To recapitulate the results of these experiments, the data show it is possible to increase the protein efficiency of a high wheat diet by 50–80 per cent by increasing the proportion of total protein provided by milk and other good quality sources from 10 per cent to 30–40 per cent of total protein intake. A similar or even greater improvement can be obtained by supplementing with lysine alone. However, by using a combination of amino acid and protein supplementation, we were able to increase protein efficiency by 150 per cent, an improvement greater than could have been realized with either type of supplementation alone. This example illustrates the powerful tools we now have at hand for raising the plane of protein nutrition wherever individuals derive

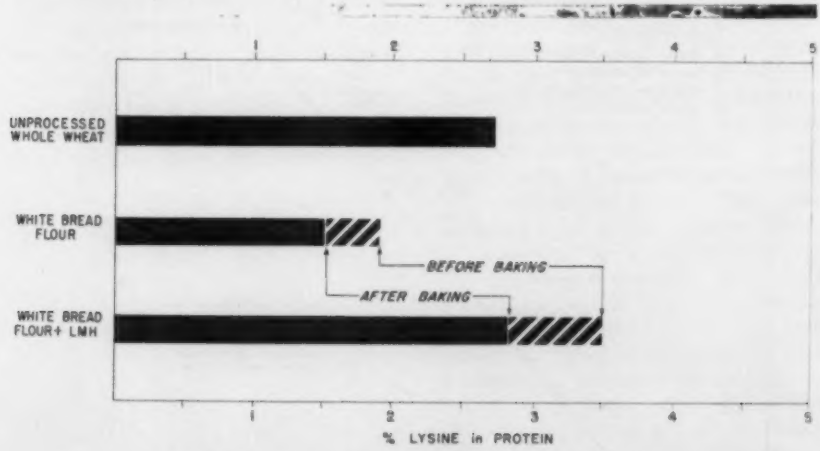


Figure 4—Restoration of Lysine Processing Losses

Addition of 0.25 Per cent LMH to White Flour Approximately Compensates for Milling and Baking Losses Incurred in Converting the Whole Wheat Grain into White Bread

nourishment from staple cereal foods produced by commercial millers or bakers.

Economic Aspects

At this point it is appropriate to consider the economics of protein and amino acid supplementation. Until now, we have considered only the improvement in protein efficiency to be obtained with protein and amino acid supplements. However, when we are comparing the economics of adding an amino acid to a food mixture as against adding a larger amount of some protein supplement, we must consider not only the efficiency but also the quantity of protein in the diet. Addition of an amino acid to a cereal flour changes the nitrogen level very little, while addition of a protein supplement can change it a lot.

It is possible to make economic comparisons by determining how much of a protein supplement is required to give the same growth in an experimental animal as a given supplement of amino acid. Thus, Jahnke and Schuck found that flour-plus-3 per cent nonfat dry milk plus 0.25 per cent L-lysine monohydrochloride, a diet having a protein content of 11.36 per cent, gave about the same weight gain over a four-week period as flour-plus-12 per cent nonfat dry milk, a diet containing 12.76 per cent protein.[18] Both efficiency and quantity have been taken into account here, so that one-quarter pound of L-lysine monohydrochloride can be equated to nine pounds of nonfat dry milk. In the United States this form of milk is priced at about 16 cents a pound in carload lots, so nine pounds would cost $1.44. The equivalent price for L-lysine monohydrochloride would therefore be $1.44 per quarter-pound or $5.76 per pound, a price that is easily foreseeable for this product.

This calculation is presented merely to show that an amino acid at a few dollars per pound can be equivalent to low-cost protein supplements. It is of course not intended to suggest that lysine be used in place of milk solids. It is better to use both. A combination of an additional 9 per cent nonfat dry milk and 0.25 L-lysine monohydrochloride, Jahnke and Schuck found, gave almost twice the weight gain obtained with either supplement alone.

Conclusion

We have now outlined our problem, which is primarily to improve the protein efficiency of human diets. We have considered the effects of low-efficiency protein diets on nutritional status and their probable deleterious effect on work output. Means of markedly improving protein efficiency by applying modern knowledge of protein and amino acid supplementation are at hand, either already known or in the process of being worked out. There is a crying need for immediate application of this knowledge for the benefit of a protein-hungry world. The steady population upsurge will make this problem ever more acute in the years ahead, so that even technically developed countries will have to use these principles to maintain a good level of nutrition. Indeed, there are large groups in the United States and other advanced countries whose protein nutrition requires improvement even today. Many dietary surveys and clinical studies have shown that inadequate protein intakes and suboptimum nutritional status occur frequently within important population segments in the United States, including children, pregnant women, adolescents, the aged, and the underprivileged.[10]

Where protein intakes are low in this country, the diet pattern shows reduced consumption of the high-efficiency animal proteins. Correspondingly, the contribution of protein from wheat and other cereal foods in the diets of these

people becomes more important, increasing from the national average of about 20 per cent to as much as 40–50 per cent of the total protein intake. An increase in the efficiency and quantity of protein in the cereal foods consumed by these individuals would contribute toward improved growth and muscle development in children and, through more abundant labile protein reserves, greater vigor and general well-being in all these population groups.

REFERENCES

1. Albanese, A. A. (ed.). "Protein and Amino Acid Requirements of Mammals." New York: Academic Press, 1950, p. 115.
2. Allison, J. B. Calories and Protein Nutrition. Ann. New York Acad. Sc. 69:1009 (Art. 5), 1958.
3. Allison, J. B. Biological Evaluation of Proteins. Physiol. Rev. 35:664, 1955.
4. Block, R. J., and Mitchell, H. H. The Correlation of the Amino Acid Composition of Proteins with Their Nutritive Value. Nutrition Abstr. & Rev. 16:249, 1946–1947.
5. Block, R. J., and Weiss, K. W. Amino Acid Handbook. Springfield, Ill.: Thomas, 1956.
6. Brown, J. W.; Flodin, N. W.; Gray, E.; and Paynter, E. The Effect of Lysine Supplementation on the Protein Efficiency of High-Protein Breads. (To be published.)
7. Burke, B. S., and Stuart, H. C. Nutritional Requirements During Pregnancy and Lactation. J.A.M.A. 137:119, 1948.
8. Culik, R., and Rosenberg, H. R. The Fortification of Bread with Lysine. IV. The Nutritive Value of Lysine-Supplemented Bread in Reproduction and Lactation Studies with Rats. Food Technol. 12:169, 1958.
9. Dole, V. P. A Relation Between Dietary Protein and Total Calorie Intake of Large Population Groups. Am. J. Clin. Nutrition 5:72, 1957.
10. Flodin, N. W. The Philosophy of Amino Acid Fortification of Foods. Cereal Sci. Today 1:165, 1956.
11. ———. Amino Acid Balance and Efficiency of Protein Utilization. Metabolism 6:350, 1957.
12. Hutchinson, J. B.; Moran, T.; and Pace, J. Effect on the Growth-Rate of Weanling Rats of Supplementing the Protein of White Bread with Lysine. Nature 178:46, 1956.
13. Jahnke, J. K., and Schuck, C. Growth Response and Liver Fat Deposition in Rats Fed Bread Mixtures with Varying Levels of Non-Fat Milk Solids and Lysine. J. Nutrition 61:507, 1957.
14. Johnston, J. A. Protein Requirements of Adolescents. Ann. New York Acad. Sc. 69:881, (Art. 5), 1958.
15. Lynch, H. D., and Snively, W. D., Jr. Hypoproteinosis of Childhood. J.A.M.A. 147:115, 1951.
16. Metcoff, J.; Goldsmith, G. A.; McQueeney, A. J.; Dove, R. F.; McDevitt, E.; Dove, M. A.; and Stare, F. J. Nutritional Survey in Norris Point, Newfoundland. J. Lab. & Clin. Med. 30:473, 1945.
17. Aykroyd, W. R.; Jolliffe, N.; Lowry, O. H.; Moore, P. E.; Sebrell, W. H.; Shank, R. E.; Tisdall, F. F.; Wilder, R. M.; and Zamecnik, P. C. Medical Resurvey of Nutrition in Newfoundland, 1948. Canad. M.A.J. 60:329, 1949.
18. Rosenberg, H. R., and Rohdenburg, E. L. The Fortification of Bread with Lysine. II. The Nutritional Value of Fortified Bread. Arch. Biochem. 37:461, 1952.
19. Rosenberg, H. R., and Rohdenburg, E. L. The Fortification of Bread with Lysine. I. The Loss of Lysine During Baking. J. Nutrition 45:593, 1951.
20. Stearns, G.; Newman, K. J.; McKinley, J. B.; and Jeans, P. C. The Protein Requirements of Children from One to Ten Years of Age. Ann. New York Acad. Sc. 69:857 (Art. 5), 1958.
21. Vohra, P., and Kratzer, F. H. Graying of Hair in Rats Fed a Ration Deficient in Lysine. Science 124:1145, 1956.

Dr. Flodin is technical manager, Lysine Division, E.I. du Pont de Nemours and Company, Inc., Wilmington, Del.

This paper was presented before the Food and Nutrition Section of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 12, 1957.

New Location for Sanitation Maintenance Show

The third annual Industrial and Building Maintenance Show, November 3–6, originally scheduled for Philadelphia, will be held instead at the New York Trade Show Building, 8th Avenue and 35th Street, New York City.

Systematic data are needed on the effect of chlorine in water on various enteric viruses. This report deals with the inactivation by chlorine of poliovirus and other enteric viruses.

THE EFFECT OF CHLORINE IN WATER ON ENTERIC VIRUSES

Sally Kelly, Ph.D., and Wallace W. Sanderson

THE STANDARDS for chlorination of today's water supplies are based primarily on data of Butterfield, et al.,[1, 2] on the inactivation of Escherichia coli and bacterial pathogens. Their experiments changed chlorination from an empirical to a scientific practice. The concentration and kind of residual chlorine as affected by pH, temperature, and contact period were found to be controlling factors in the death of bacteria. While many studies indicate that viruses are inactivated by chlorine, systematic data, comparable to Butterfield's, are available for only two viruses: adenovirus type 3, inactivated by concentrations of free residual chlorine similar to those Butterfield found lethal to E. coli,[3] and Coxsackie virus A 2, which required seven to 46 times more residual chlorine for inactivation.[4] The following report extends our information on the inactivation of viruses by chlorine to polioviruses and other kinds of Coxsackie viruses.

Methods and Materials

Experiments were designed to minimize the effects of chlorine demand. Virus strains, grown and harvested as tissue culture fluids, were partially purified by adsorption onto and elution from Dowex 1 resin with demand-free water buffered at pH 7 and were stored in sealed lyophilization vials at — 20° C. While these preparations, as such, were not demand-free under experimental conditions, they exhibited little demand when diluted with demand-free buffered water. When titrated amperometrically[5a] (15 minutes exposure to 0.2 ppm chlorine at pH 7 at 25° C) the 100-fold dilution had no chlorine demand. Since differences between free and total available chlorine were noted with orthotolidine-arsenite (OTA) test reagents, however, both free and total forms of residual chlorine were measured. The amount of free and total residual chlorine decreased during the experimental period. Figure 1 indicates the average loss of free residual chlorine which occurred. The concentrations of free residual chlorine listed in tables and figures refer to those present initially (measured after viruses and chlorine solutions had been mixed for one minute). At the end of eight minutes, for example, a solution initially containing 0.30 ppm free residual chlorine usually had 0.25 ppm remaining. The levels of combined chlorine found, 0.10 ppm or less, did not inactivate viruses during the periods observed.

Water was made chlorine demand-free by dosing glass-distilled water with chlorine water to contain approximately 10 ppm free residual chlorine and storing

it for several days in the dark. It was buffered to chosen pH levels by adding mixtures of the following substances: to pH 5 by 0.2N acetic acid and sodium acetate; to pH 6 and pH 7 by M/15 potassium dihydrogen orthophosphate and sodium monohydrogen orthophosphate; to pH 8 and pH 9 by boric acid; 1N sodium hydroxide, and 0.1N hydrochloric acid; to pH 10 by boric acid and 0.1N sodium hydroxide.[6] The buffered water was redosed with chlorine (0.4 to 2 ppm free residual chlorine), stored away from sunlight, and shortly before use was exposed to bright sun to dispel remaining chlorine. Buffered water prepared in this manner was demand-free when titrated amperometrically (1 ppm chlorine, 30-minute contact).

Glassware for use with virus-chlorine mixtures (flasks, pipettes, jars) was "aged" in chlorine solutions (<10 ppm) and rinsed with distilled and demand-free water. Small but consistent chlorine losses occurred if the glassware was not aged.

A stock solution of chlorine water was made by bubbling chlorine gas through distilled water to give a total chlorine content of approximately 1,500 ppm by iodometric titration.[5b] The solution was standardized each time before use and was kept in darkness at from 5° to 10° C, except when aliquots were withdrawn. It was renewed when the concentration decreased to less than 500 ppm.

Residual chlorine concentrations were determined by the OTA method.[5c] Colorimetric measurements were made in a Beckman spectrophotometer at 470 mμ in 1 cm cells or in a Klett-Summerson photoelectric colorimeter with Corning filter No. 42 (blue) previously calibrated with a series of temporary standards.[5d] Mono- and dichloramines in solutions of combined chlorine were measured amperometrically.

Combined chlorine solutions were made by adding aliquots of a stock solution of ammonium chloride to demand-free water buffered at various pH values and dosing with chlorine water to give the desired total residual chlorine after a one-hour period at room temperature in the dark. Ammonia nitrogen in these solutions was determined by direct Nesslerization.

Experiments were carried out in the dark at room temperature (25°–28° C) and in an ice water bath at 1°–5° C. Free residual chlorine concentrations ranged from 0.02 to 0.35 ppm. Com-

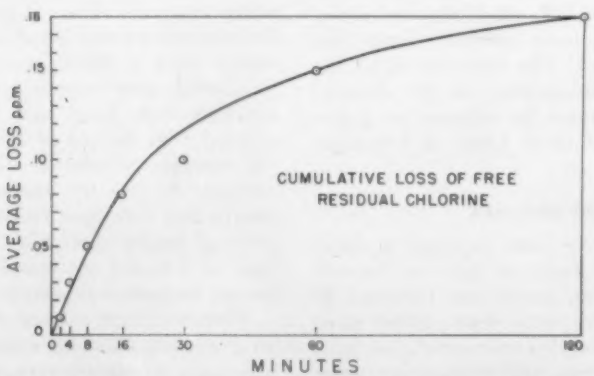


Figure 1—Loss of Free Residual Chlorine in ppm During Experimental Periods.

bined chlorine solutions contained approximately 0.7 ppm residual chlorine and 0.4 ppm ammonia nitrogen.

Steps in the experimental procedure included the addition of virus to 200 ml of buffered water; removal of an aliquot for titration of initial virus; addition of chlorine solution to virus-water suspensions in volumes less than 1 ml and mixing; removal of samples at intervals for residual chlorine and infectivity measurements. Five and a half millili-

Table 1—Per cent of $TCID_{50}$ Remaining After Exposure to Free Chlorine at 25°–28° C

Virus Strain	pH	Free Residual Chlorine (ppm)	Per cent $TCID_{50}$ Minutes 1	2	4	8	16	30	60	120
Polio 1 (Mahoney)	6	0.06	10	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		0.30	33	10	1	1	0.3	0.3	0.1	0.1
	7	0.21	3	0.03	<0.03	<0.03				
		0.23	3	1	0.03	0.001	0.001	<0.001	<0.001	<0.001
		0.29	3	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	8	0.15			0.02	<0.01	<0.01	0.01	<0.01	
		0.28	10	1	<0.03	<0.03	<0.03	<0.03	<0.03	
	9	0.30	33	10	10	<0.1	<0.1	<0.1		
	10	0.19	100	100	33	10	3	<0.1	<0.1	
		0.27								
Polio 1 (487)	7	0.22	33	33	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
		0.27								
Polio 1 (MK 500)	6	0.25	100	3	<0.1	<0.1	<0.1	<0.1	<0.1	
	7	0.22	100	3	0.3	0.03	0.03	<0.03		
		0.26	33	10	1	<0.03	0.3	<0.3	<0.3	
	8	0.31	100	100	1	10	<0.3	<0.3	<0.3	
	9	0.27	100	100	10	1	<0.3	<0.3	<0.3	
	10	0.22	100	30	30	30	3	1		
Polio 2 (MEF_1)	7	0.18	10	<1	<1	<1	<1	<1	<1	
		0.20	2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	
	8	0.23	33	3	3	1	<1	<1	<1	
	9	0.08			20	20	10	>10	2	
		0.13	100	100	<3	<3	3	<3	3	<3
Polio 3 (Saukett)	7	0.17	10	0.3	0.3	<0.3	0.3	<0.3	<0.3	<0.3
		0.22	10	3	1	3	<1	<1	<1	<1
	8	0.16	100	100	10	0.3	0.1	<0.1	<0.1	
	9	0.14	100	333	<10	1	0.1	<0.1	0.3	
Coxsackie B 1 (49683)	7	0.26	3	3	3	<0.1	<0.1	<0.1	<0.1	
		0.35	3	0.3	<0.03	0.03	<0.03	<0.03	0.03	0.03
	8	0.26	10	3	0.1	<0.1	1	0.3	0.3	<0.1
	9	0.21	10	1	1	0.1	<0.03	0.3	<0.03	<0.03
		0.30	100	10	10	0.3	<0.1	<0.1	<0.1	<0.1
Coxsackie B 5 (EA 80)	5	0.31	1	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	
	6	0.29	1	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	
	7	0.25	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
		0.27	10	1	<0.3	<0.3	<0.3	<0.3		
	8	0.24	10	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
	9	0.25	100	10	1	<0.3	<0.3	<0.3	<0.3	
	10	0.25	100	30	30	3	0.3	0.3	<0.1	

ters were removed for free, and a similar volume for total, residual chlorine tests; 1 ml samples for infectivity measurements were added to 0.25 ml N/10 sodium thiosulfate to stop the action of chlorine before titration. Aliquots taken before the addition of chlorine solutions were similarly treated.

The following enteric viruses were studied: poliovirus types 1 (Mahoney), 2 (MEF_1), and 3 (Saukett), Coxsackie B 1 (49683) and B 5 (EA 80). These strains had been cultivated in monkey kidney or HeLa cell cultures. Two strains of poliovirus type 1, MK 500 and 487, recently isolated from sewage, were also included. Estimates of initial virus titers in HeLa cell tube cultures indicated that the suspensions contained from 300 to 3,000 fifty per cent tissue culture infectious doses per 0.1 ml, a variation which did not noticeably influence the inactivation rate.

Virus titers were estimated by the serial-dilution method in HeLa cell test tube cultures by inoculating a series of duplicate tubes with undiluted and 10-fold dilutions of suspensions and observing them daily for at least six days. The cells were grown for at least four days in a medium containing Hanks' balanced salt solution,[7] yeast extract, tryptose, and human adult serum. Before use they were rinsed twice with Syverton's medium,[8] and in tests were cultured in Syverton's medium containing calf serum. Cultures were incubated at 33°–35° C. Poliovirus type 1 suspensions before purification were cytopathogenic to such cells in dilutions of 10^{-6} or less. Cultures in which cells characteristically degenerated during the observation period were considered to contain virus. Cytopathogenic effects on cells after this period were difficult to distinguish from normal degeneration, and fluids from such aging cultures were usually not infectious. If degeneration was questionable during the observation period, fluids were saved and passed in fresh tissue cultures for verification. Virus titers were expressed as

Table 2—Per cent of $TCID_{50}$ Remaining After Exposure to Free Chlorine at 1°–5° C

Virus Strain	pH	Free Residual Chlorine (ppm)	Per cent $TCID_{50}$ Minutes							
			1	2	4	8	16	30	60	120
Polio 1 (Mahoney)	6	0.30	100	3	0.3	<0.1	<0.1	<0.1		
	7	0.30	30	3	1	0.1	0.01	<0.01		
		0.30	10	0.3	1	0.3	0.03	0.01		
	10	0.28	30	10	3	3	0.3	0.03		
Polio 1 (MK 500)	7	0.30	100	10	30	3	1	<0.3	<0.3	<0.3
	8	0.25	100	10	30	30	10	10	10	<0.3
Polio 2 (MEF_1)	7	0.03						3	<0.1	<0.1
		0.14						<0.1	<0.1	<0.1
		0.22	10	<1	<1	<1	<1	<1	<1	<1
		0.23	30	3	1	1	<0.3	<0.3	<0.3	
Polio 3 (Saukett)	7	0.15						0.03	0.01	<0.01
Coxsackie B 5 (EA 80)	7	0.30	100	10	3	3	0.3	<0.1	<0.1	
	8	0.26	100	10	30	3	3	<0.3	<0.3	

Table 3—Per cent of $TCID_{50}$ Remaining After Treatment with Combined Chlorine at 25°–28° C

Virus Strain	pH	Concentrated Combined Chlorine	Per cent $TCID_{50}$ Time (Hours)					
			1	2	4	8	22	30
Polio 1 (Mahoney)	7	0.72	30	3	0.3	0.1	<0.1	<0.1
Polio 2 (MEF_1)	7	0.63	30		1		1	1
	9	0.98	30		<1		3	<1
Polio 3 (Saukett)	8	0.67	100	100	>10	0.1	0.1	<0.1
	9	0.79		10	10		30	
Coxsackie B 1	7	0.67	3	3	3		<0.1	<0.1
	8	0.68	10	1	1		<0.03	<0.03
Coxsackie B 5 (EA 80)	6	0.87	10	1	<0.3		<0.3	<0.3
	10	0.86	100	10	<0.3		<0.3	<0.3

the logarithm of the reciprocal of virus dilution giving 50 per cent end point, estimated by the moving-average interpolation method of Thompson.[9]

Results

The results obtained from the experiments on chlorination of viruses are listed in Tables 1, 2, 3, and 4. The

Table 4—Per cent $TCID_{50}$ Remaining After Treatment with Combined Chlorine at 1°–5°C

Virus Strain	pH	Concentrated Combined Chlorine	Per cent $TCID_{50}$ Time (Hours)					
			1	2	4	8	22	30
Polio 1 (Mahoney)	7	0.8	10	10	3		0.03	<0.03
	8	0.8	100	100			0.1	<0.03
	9	0.8	100	100			<0.3	<0.3
Polio 2 (MEF_1)	6	0.86	30	30	30	1		
	7	0.76	100	100	10	10	30	100
	8	0.75	100	10	1	3	3	10
	9	1.25	100	100	100			

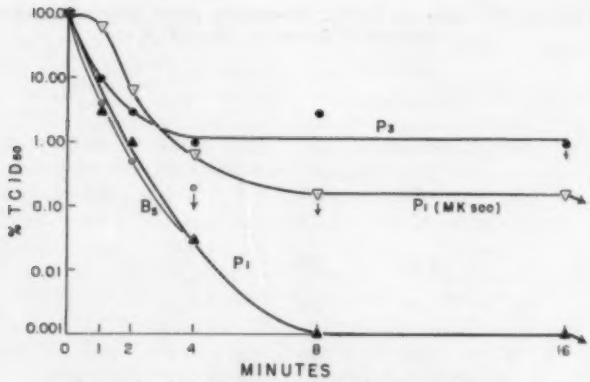


Figure 2—Inactivation of Four Strains of Virus—25°–28° C, pH7, 0.20–0.25 Free Residual Chlorine.

data are expressed as percentage of initial virus dose ($TCID_{50}$) remaining after exposure to chlorine solutions. The interpretation of these data follows:

Free Chlorine

Strain Sensitivity—Viruses were considered to be inactivated when 99.7 per cent or more initial virus was destroyed. The rate at which they were inactivated was influenced by the strain observed. Coxsackie B 5 virus, for example, was destroyed more rapidly than other strains (Figure 2). The poliovirus 1 (MK 500) strain took from two to four times longer than the Mahoney strain. Inactivation of poliovirus 1 (Mahoney) and poliovirus 2 resembled that of Coxsackie B 5 rather than that of other polioviruses; while poliovirus 3 and Coxsackie B 1 virus were inactivated at a rate comparable to that of poliovirus 1 (MK 500). Parallel experiments in the cold (1° to 5°C) indicated that these strain differences were consistent. Observations of the effects of chlorine were therefore made on both seemingly resistant (poliovirus 1 MK 500) and sensitive (Coxsackie B 5) strains.

Concentration—The concentration of free residual chlorine which inactivated viruses at pH 7 after two minutes, contact was 0.3 ppm for polioviruses 1 (Mahoney and MK 500), and 0.2 ppm for Coxsackie B 5 (Table 5). Lesser

Table 5—Inactivation of Polio 1 (Mahoney), Polio 1 (MK 500), and Coxsackie B 5 by Various Concentrations of Free Residual Chlorine at pH 7, 25°–28° C for Two Minutes

Concentration Free Residual Chlorine	Per cent $TCID_{50}$		
	Polio 1 (Mahoney)	Polio 1 (MK 500)	Coxsackie B 5
0.1	3	3.10	10
0.2	1		<0.3
0.3	0.1	0.3	<0.3
0.5	1		
0.8		<0.03	<0.3

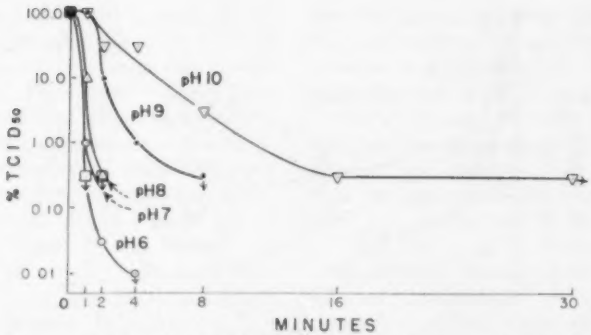


Figure 3a—Inactivation of Coxsackie B 5 Virus at pH 6–10 at 25°–28° C, with 0.24–0.29 ppm Free Residual Chlorine.

concentrations inactivated less than 99.7 per cent initial virus. The two-minute contact was chosen to show concentration effects, since inactivation was rapid during that period.

Rate—The losses in infectivity of Coxsackie B 5 virus and of poliovirus 1 (MK 500) after exposure to 0.2–0.3 ppm free residual chlorine for various lengths of time are shown in Figures 3a and 3b. The figures indicate that the curves describing the rates of inactivation depend upon conditions of the experiment. The inactivation rate of Coxsackie B 5 under certain conditions (pH 6 to 8) was constant, i.e., the loss was proportional to time, and the relationship approaches linearity (Figure 3a). Under other conditions (pH 9 and 10), the relationship is expressed as a sigmoid curve. Inactivation of poliovirus 1 (MK 500), on the other hand, did not proceed at a constant rate except when measured at pH 6; loss of infectivity was not proportional to time, and the relationship is expressed graphically as a sigmoid curve (Figure 3b). It is apparent that strain type and pH value are factors affecting the relationship between inactivation and time.

The concentration of residual chlorine is another factor which influenced the

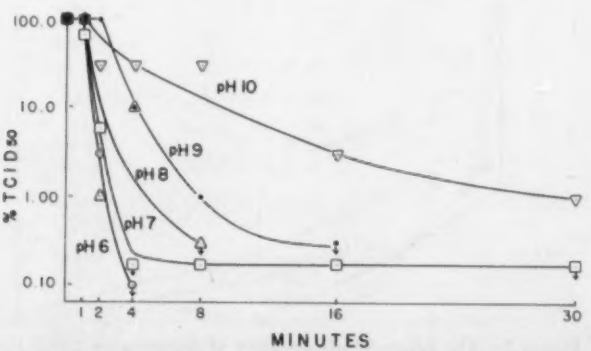


Figure 3b—Inactivation of Poliovirus 1 (MK 500) at pH 6–10 at 25°–28° C, with 0.22–0.31 ppm Free Residual Chlorine.

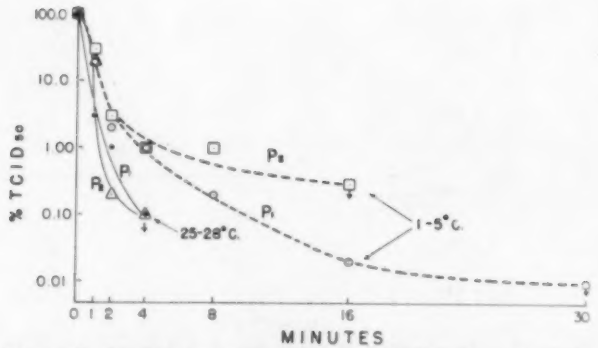


Figure 4—Inactivation of Poliovirus 1 (Mahoney) and Poliovirus 2 (MEF_1) at pH 7, at 1°–5° C and at 25°–28° C, with 0.20–0.30 ppm Free Residual Chlorine.

relationship between inactivation and time. Linearity was approached as higher concentrations of residual chlorine were used. Higher temperatures also made the inactivation approach a linear relationship with time (Figure 4). These factors—sensitive strain, low pH value, high chlorine concentration, and high temperature—are known to favor inactivation of bacteria by chlorine; it is of interest to note that they not only favor the rate of inactivation of viruses but also its approach to a linear relationship with time.

Hydrogen-ion Concentration

pH level influenced the rate of inactivation (Figures 3a and b). Free residual chlorine concentrations of 0.25 ppm inactivated Coxsackie B 5 virus in one minute at pH 7 and in 30 minutes at pH 10. Poliovirus 1 (MK 500) required up to 15 minutes exposure at pH 7 and over 30 minutes at pH 10.

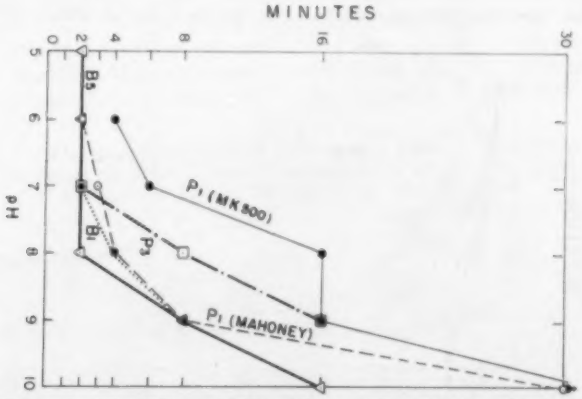


Figure 5—The Effect of pH on Time of Inactivation (99.7 Per cent) of Viruses at 25°–28° C by 0.2–0.3 ppm Free Residual Chlorine.

The retarding effect with increase in pH level was noticeable also when other virus strains were comparably tested (Figure 5). The influence of pH level on inactivation time was obvious at 1° C also. At this temperature residual chlorine concentrations of 0.25–0.30 ppm took twice as long to inactivate Coxsackie B 5 virus at pH 8 as at pH 7. Inactivation times of other viruses observed, polioviruses 1 (MK 500) and (Mahoney), were also prolonged when the pH was greater (Table 6).

Time

The time required for inactivation was dependent on other factors, pH level, concentration of residual chlorine, and temperature among them. At room temperature, at a concentration of 0.25–0.30 ppm, inactivation of Coxsackie B 5 was so rapid between pH levels of 5 and 8 that no detectable changes in rate were observed with increase in pH units. The time of inactivation above pH 8, however, was retarded two- to fourfold, with a 1-unit rise of pH. Inactivation time of the Mahoney strain, similarly, was not affected, except at pH 8 and higher, when two to four times the exposure period was required. The inactivation time of poliovirus 1 (MK 500), on the other hand, was retarded two- to threefold, with unit rises in pH from 7 to 9.

Table 6—Time Required for 99.9 Per cent (or Greater) Inactivation by Free Residual Chlorine

Temperature	Virus Strain	Concentration of Free Chlorine ppm	Time (Minutes) pH 6	7	8	9	10
25°–28° C	Polio 1 (Mahoney)	0.01–0.10		16			
		0.11–0.20			5		
		0.21–0.30	2	3	4	8	30
	Polio 1 (487)	0.21–0.30		4			
	Polio 1 (MK 500)	0.21–0.30	4	6	12	16	>30
	Polio 2	0.11–0.20		2			
	Polio 3	0.11–0.20		2	8	16	
	Coxsackie B 1	0.21–0.30		8	4	8	
		0.31–0.40		2			
	Coxsackie B 5	0.21–0.30	2	1	2	8	16
1°–5° C	Polio 1 (Mahoney)	0.11–0.20		8			
		0.21–0.30	4	8			16
	Polio 1 (MK 500)	0.21–0.30		30	120		
	Polio 2	0.01–0.10		60			
		0.11–0.20		30			
		0.21–0.30		16			
	Polio 3	0.11–0.20		30			
	Coxsackie B 5	0.21–0.30		16	30		

The inactivation time of poliovirus 3 resembled that of poliovirus 1 (MK 500) in response to rise in pH. In the cold, a rise in pH value retarded inactivation times throughout the range studied (pH 6 to 10) by as much as fourfold for a 1-unit rise (poliovirus 1 MK 500). The time required for inactivation, therefore, should be expressed also in terms of pH value, chlorine concentration, temperature, and virus strain. Table 6 lists typical inactivation times (99.7 per cent or greater) observed.

Combined Chlorine

A limited number of tests with combined chlorine solutions indicated that viruses were inactivated by such treatment. A much longer contact period, however, and higher concentrations of residual chlorine were necessary than when residual chlorine was in the free form. Contact periods of at least four hours with total residual chlorine concentrations of approximately 0.7 ppm were required for 99.7 per cent inactivation when the pH level was 7.

The difference in strain sensitivity to chlorine noted when free chlorine was used held also for inactivation by combined chlorine. Coxsackie B 5 virus and poliovirus 1 (Mahoney) were inactivated more rapidly than other strains (Tables 3 and 4).

The retarding effect of higher pH levels was noticeable in the first two or three hours of the inactivation period. Inactivation in the cold was from two to five times slower than at room temperature; an eight-hour exposure at 1°C at pH 9, for example, had no inactivating effect on poliovirus 2.

Discussion

The data indicate that enteric viruses differ in their sensitivity to chlorine solutions. A similar distinction had been noted for enteric bacteria.[1] The differences among viruses are between strains rather than types. Poliovirus 1 (Mahoney), for example, resembled Coxsackie B 5 more than polioviruses 1 (MK 500) and (487), which were recently isolated. Inactivation of Coxsackie B 1 virus and poliovirus 3 followed the pattern of poliovirus 1 (MK 500). The homogeneity of the suspensions was not scrutinized, and it may be that the recently isolated strains, having undergone fewer passages, retained a greater variety of particles.

The practice of chlorination for disinfection of viruses in water, then, should be interpreted in terms of resistant strains as well as of the other well known factors for bacterial disinfection: pH level, chlorine concentration, contact period, temperature, water composition, and chlorine form. With free residual chlorine concentrations of 0.20–0.30 ppm, contact periods of at least 30 minutes at 25°–28° C were required to inactivate viruses completely at pH 7. Most of the infectious virus (99.7 per cent), but not all, was removed by contact periods of eight minutes or less at pH 7. Thirty minutes or longer were required for complete inactivation at 1°–5° C. Chlorination of waters at pH 7 with free residual chlorine concentrations of 0.2 ppm for 10 minutes apparently does not destroy typical strains of enteric viruses. Inactivation by combined chlorine solutions was a matter of hours rather than minutes, requiring total chlorine residuals of at least 0.7 ppm.

The pH studies indicate that rises in pH values above 6 may decrease the disinfecting properties of free residual chlorine. Changes in the pH range 6 to 8 had no significant effect on the disinfecting properties of free residual chlorine on E. coli,[1] and it is interesting to note that a recommendation for the use of free rather than combined chlorine is based on this fact.[10] The present experience illustrates the necessity for including a variety of agents or strains. In-

deed, additional strains may present a behavior pattern toward pH different from the two patterns now known.

The degree and type of cultivation offer a clue to the variation in resistance of strains to chlorine noted here and earlier. Strains in these experiments were grown in tissue culture, the most resistant having undergone the fewest passages. The source of hepatitis virus resistant to normal chlorination procedures was a fecal specimen [11]; the strain of Coxsackie A 2 which required more residual chlorine for inactivation than E. coli was grown in mice [4]; adenovirus type 3, resembling E. coli in sensitivity to residual chlorine, on the other hand, was a strain grown in the HeLa cell line.[8] In comparisons among agents of this sort, the homogeneity of suspensions and their pedigrees may be significant.

The effects of various factors on the relationship between inactivation and time were instructive. A family of curves resulted, departing from linearity according to the chosen conditions. This property has been observed for bacterial disinfectants [12] and apparently is characteristic of viral disinfectants as well. The relationship between inactivation and time is obviously subject to the play of many factors.

Summary

Complete inactivation of enteric viruses (beyond the limit of detection) was not achieved by the usual conditions for bacterial disinfection of water supplies, i.e., free residual chlorine concentrations of 0.2 ppm for 10-minute contact at pH 7. Concentrations of free residual chlorine of from 0.2 to 0.3 ppm inactivated viruses after contact periods of 30 minutes. Contact periods of at least four hours were necessary for inactivation by combined residual chlorine concentrations of 0.7 ppm.

Factors which affected the inactivation of viruses were strain, pH level, free residual chlorine concentration, exposure time, and temperature. Strains in decreasing order of their sensitivity to chlorine were as follows: Coxsackie B 5, poliovirus 1 (Mahoney), poliovirus 2, Coxsackie B 1, poliovirus 3 and poliovirus 1 (MK 500). Rises in pH value of one unit above pH 7 more than doubled the contact period necessary for inactivation of several strains. Concentrations of free residual chlorine of greater than 0.2 ppm for contact periods longer than 10 minutes were necessary for inactivation, depending on virus strain, temperature, and pH level. A 20° C lowering of temperature slowed inactivation two- to 15-fold.

The results suggest that inactivation of enteric viruses in water at pH 7, 25° C, requires a minimum free residual chlorine concentration of 0.3 ppm for contact periods of at least 30 minutes; at higher pH levels or lower temperatures, more intensive chlorination is necessary.

REFERENCES

1. Butterfield, C. T.; Wattie, Elsie; Megregian, Stephen; and Chambers, C. W. Influence of pH and Temperature on the Survival of Coliforms and Enteric Pathogens When Exposed to Free Chlorine. Pub. Health Rep. 58:1837–1866 (Dec.), 1943.
2. Butterfield, C. T., and Wattie, Elsie. Influence of pH and Temperature on the Survival of Coliforms and Enteric Pathogens When Exposed to Chloramine. Pub. Health Rep. 61:157–192 (Feb.), 1946.
3. Clarke, N. A.; Stevenson, R. E.; and Kabler, P. W. The Inactivation of Purified Type 3 Adenovirus in Water by Chlorine. Am. J. Hyg. 64:314–319 (Nov.), 1956.
4. Clarke, N. A., and Kabler, P. W. The Inactivation of Purified Coxsackie Virus in Water by Chlorine. Am. J. Hyg. 59:119–127 (Jan.), 1954.
5. American Public Health Association, American Water Works Association, and Federation of Sewage and Industrial Wastes Associations. Standard Methods for the Examination of Water, Sewage and Industrial Wastes (10th ed.). New York: American Public Health Association, 1955. (a) p. 77; (b) p. 63; (c) p. 72; (d) p. 68.
6. Clark, W. M. The Determination of Hydrogen Ions (3d ed.). Baltimore: Williams and Wilkins, 1928, p. 203.
7. Weller, T. H.; Enders, J. F.; Robbins, F. C.; and Stoddard, M. B. Studies on the Cultivation of Poliomyelitis Viruses in Tissue Culture. I. The Propagation of Poliomyelitis Viruses in Suspended Cell Cultures of Various Human Tissues. J. Immunol. 69:645–671 (Dec.), 1952.
8. Syverton, J. F.; Scherer, W. F.; and Elwood, P. M.

Studies on the Propagation in vitro of Poliomyelitis Viruses. V. The Application of Strain HeLa Human Epithelial Cells for Isolation and Typing. J. Lab. & Clin. Med. 43:286-302 (Feb.), 1954.
9. Wadsworth, A. B. Standard Methods of the Division of Laboratories and Research of the New York State Department of Health (3d ed.). Baltimore: Williams and Wilkins, 1947, p. 151.
10. New York State Department of Health, Office of Professional Training. Training Manual for Water Plant Chlorinator Operators. Albany: The Department, 1956, p. 18 (mimeo.).
11. Neefe, J. R.; Stokes, Joseph, Jr.; Baty, J. B.; and Reinhold, J. G. Disinfection of Water Containing Causative Agent of Infectious (Epidemic) Hepatitis. J.A.M.A. 128:1076-1080 (Aug. 11), 1945.
12. Wilson, G. S., and Miles, A. A. Topley and Wilson's Principles of Bacteriology and Immunity (4th ed.). Baltimore: Williams and Wilkins, 1955, Vol. I, p. 150.

Dr. Kelly is a senior research scientist; Mr. Sanderson is assistant director in charge of laboratories for sanitary and analytical chemistry, Division of Laboratories and Research, New York State Department of Health, Albany, N. Y.

This paper was presented before the Laboratory Section of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 15, 1957.

NFIP Announces New Program

The National Foundation for Infantile Paralysis, in recently announcing its program for the future, also announced a change in its name to the National Foundation. As reported, the Foundation will "center on the development of an organized force in the fields of medical research, patient aid, and professional education, flexible enough to meet new health problems as they arise." The keynote of its future program is research.

The first new goals will be research, and eventually a patient aid program, in arthritis and congenital malformations, as well as continuing the job still to be done in polio, particularly for those earlier crippled from the disease, and continuing virus research and educating all persons under 40 to be vaccinated against polio.

Current plans have been formulated on the basis of five years investigation of areas of need in the health field and consultation with medical, civic, and government leaders and Foundation chapters.

In making the announcement President Basil O'Connor of the Foundation said that it would make no attempt to duplicate the work of voluntary agencies, although it will pursue scientific breakthroughs wherever they lead, with the general objective of improving man's health.

In the 20 years of the Foundation's existence it has raised and spent nearly half a billion dollars. Nearly two-thirds of this was spent in behalf of patient care, nearly 7 per cent each for research and for education.

This is a discussion of statistical methods in case-finding studies where there is no accurate or precise diagnostic test for the disease and where the frequency of its occurrence in the population is small. Attention is also given to ways of increasing the efficiency of such studies.

SAMPLING AND SCREENING PROBLEMS IN A RHEUMATIC HEART DISEASE CASE-FINDING STUDY

Edmund A. Gehan, Ph.D.

IN RECENT years, an increased number of case-finding studies and screening examinations have been conducted to discover unrecognized cases of disease. In many instances, the disease is one that is not easily discerned so that diagnostic and screening technics must be used to divide the population into presumed negative and suspect groups.

The criterion for a screening diagnosis has varied with the particular disease. In studies of tuberculosis, for example, x-rays have been successfully used to sort out suspicious individuals. In testing for some other diseases, such as syphilis, a single laboratory procedure seems sufficiently sensitive and accurate to detect the disease. Rheumatic heart disease presents a more involved problem since no single or simple diagnostic test has been discovered that is deemed satisfactory for a population study.

In this paper, some statistical methods are discussed connected with case-finding studies involving diseases that (1) have a small frequency of occurrence in the general population, and (2) have no accurate diagnostic test. Specifically, the results pertain to a rheumatic heart disease case-finding study conducted in 1953–1954 by the North Carolina Heart Association, the North Carolina State Board of Health, and the Department of Biostatistics of the University of North Carolina.

This rheumatic heart disease study was intended to investigate the effectiveness of a process in which a number of doctors screened a population of children by examination and divided them into groups by degrees of suspicion for rheumatic heart disease, viz., normal, functional murmur, and suspect groups. Following this, samples were taken from each of the three groups and a more detailed and costly examination was made, including a complete battery of the necessary laboratory tests. To the author's knowledge, this is the first study of this disease where an effort was made to obtain an estimate of the percentage of false-negatives in the so-called negative groups. The statistical methods developed during the study refer (1) to problems of subsequent sampling from the groups screened, and (2) to the conditions for the improvement of the screening process by a change in the screening examination.

Data from the North Carolina Study

A total of 3,521 sixth grade school children were examined in a preliminary

screening examination in Caldwell, Durham, and New Hanover Counties. The sixth grade school children were selected for study because this age group has had a reasonable chance to develop the disease and most of the resident population completes this grade before dropping out of school. The group studied was not obtained by probability sampling (had it been, the subsequent sampling problems would be double sampling problems) but was considered the best group available with the limited resources available. The results of the screening examination by county and total are shown in Table 1.

The percentage of individuals classified suspect was substantially lower than the predicted 10–20 per cent and varied from a low of 3.8 per cent in Durham to a high of 8.3 per cent in Caldwell.

The question of how to select a sample from the normal, functional murmur and suspect groups is answerable, contingent upon the purpose of the study. Possible purposes are (for a fixed cost): (1) finding the maximum number of cases, and (2) estimating with minimum variance the prevalence of the disease.

To select a sample of n individuals from the three screened groups such that the expected number of cases detected is a maximum is a simple matter if the screening has differentiated appropriately a person's probability of having the disease. That is, after the screening examination, the probability that a person has rheumatic heart disease should be highest for an individual in the suspect group, next highest for an individual in the functional murmur group, and so on. If this is the situation, the n individuals to be reexamined should be chosen from the suspect group first; if this number is less than n, then the remainder should be taken at random from the functional murmur group, and so on to the normal group. This would intuitively be a good procedure and is probably the one most carried out in practice. It is easily shown that the expected number of cases detected is a maximum. However, if only the suspect group is reexamined, no estimate of the false-negatives can be obtained from the groups not reexamined.

The procedure described should be used when the administrator desires only the greatest return in expected yield of cases for each dollar spent, provided that the screening examination differentiates a person's risk of having the disease.

If the purpose of the study is to estimate the prevalence of the disease with minimum variance, the samples must be taken from all groups. In a general situation, there would be L groups used in the screening process where each group contained $N_1, N_2, \ldots, N_L$ individuals. Some diseased individuals are probably placed in a stratum other than the "suspect" stratum because the preliminary examination is quick and might

Table 1—Results of the Screening Examination by County and Total

County	Number of Individuals			Total
	Normal	Functional Murmur	Suspect	
Caldwell	802	176	89	1,067
Durham	925	236	47	1,208
New Hanover	874	311	61	1,246
Total	2,601 (73.9%)	723 (20.5%)	197 (5.6%)	3,521

be conducted by a doctor who is not an expert in the diagnosis of that disease. To get an estimate of the over-all prevalence, p, that minimizes the variance of the estimate, subject to a fixed sample size n, a stratified random sample should be taken. The theory for this type of sample is given in Cochran.[1]

Designate

N = total number of individuals in the population

N_h = total number of individuals in stratum (or group) h

n_h = number of individuals sampled from stratum h

$\sum_{h=1}^{L} n_h = n$ = total number of individuals reexamined.

The variance of the estimate of p is

$$V(\hat{p}) = \frac{1}{N^2} \sum_{h=1}^{L} \frac{N^2_h(N_h - n_h)}{(N_h - 1)} \frac{p_h q_h}{n_h}$$

where p_h and q_h are the true proportions in stratum h with and without the disease respectively.

The values of n_h with n fixed that minimize the variance of the estimate of p are:

$$\frac{n_h}{n} = \frac{N_h \sqrt{p_h q_h}}{\sum_{h=1}^{L} N_h \sqrt{p_h q_h}}$$

as given by Cochran.[1] In a particular problem, estimates of p_h and q_h are substituted in the formula to obtain the optimum stratum sample sizes. The p_h and q_h values can be approximated by experience and knowledge of the qualifications of the doctors who conduct the screening examination and the amount of time and facilities devoted to it. From the approximate formula above, one sees that sample sizes will be larger from strata with large populations and larger from strata with a high proportion of diseased (up to the value $p_h = \frac{1}{2}$).

If no estimates of p_h, q_h are available, then a system of proportional allocation based on the number of individuals in each stratum could be used.

Sampling and Estimation of Prevalence in the North Carolina Study

In the North Carolina study, we wished to find as many cases as possible but also to estimate the proportions of false-negatives in the nonsuspect groups. Consequently, all the individuals were scheduled for sampling in the suspect group and successive random samples were taken from the other groups. Originally, a sequential type sampling scheme was devised for use with the negative groups but was abandoned because new examination sessions might have had to be planned each time the results of one session were scrutinized. This was not convenient. The data have been treated as if stratified random samples were taken from the negative groups. Table 2 shows the sizes of samples drawn from the negative groups as well as those from the suspect group who were reexamined.

There were slight discrepancies between the number actually observed and the number scheduled because of absentees caused by moving and other reasons. Twenty-four children of suspect group (or about 12 per cent) and about 8 per cent from the other groups were absent from the scheduled reexamination. The children were followed up by interviewing school officials, public health nurses, local doctors, and parents. The follow-up accounted for nearly all of the missing children and resulted in two of the missing suspect children in Caldwell being classified as definite cases.

An estimate of the prevalence of rheumatic heart disease in the sixth grade school children is based on the estimated number of cases in those individuals in the three counties. Considering each group in each county as a separate stratum, estimates of the number of cases of definite and probable rheumatic heart disease are obtained in Tables 3 and 4, respectively. These estimates are based

Table 2—Number and Percentages * of Children Actually Reexamined by Classification on the Screening Examination and by County and Total

County	Classification on First Examination			Total
	Normal	Functional Murmur	Suspect	
Caldwell	66(8)	54(31)	74(83)	194(18)
Durham	71(8)	32(14)	42(89)	145(12)
New Hanover	73(8)	63(20)	57(93)	193(16)
Total	210(8)	149(21)	173(88)	532(15)

* The number in ( ) represents the percentage of children reexamined in that stratum.

on the almost complete reexamination of the suspect groups and the false-negative rates in the other strata. The estimated prevalence rate is 6.8 per 1,000 for all three counties with the standard deviation being 3.4 (using the formula for stratified random sampling).

The estimated case rate for probable rheumatic heart disease is 8.2 per 1,000 with the standard deviation being 3.7 (using the formula for stratified random sampling).

Examination of these figures reveals that Caldwell County had the highest case rates for both definite and probable rheumatic heart disease. The figures for Durham are low in both the definite and probable rheumatic heart categories. In New Hanover, there is a rather high rate in the probable rheumatic heart category.

The estimated rates are markedly different in the three counties. However, not too much significance can be ascribed to this, in view of the small number of cases involved. Where there were misclassifications in the negative groups, the estimated rates were high. There were four misclassifications in Caldwell and two in New Hanover. Thus, it is estimated that 16 cases of definite rheumatic heart disease and 19 cases of probable rheumatic heart disease were missed because all children were not reexamined in the normal and functional murmur groups on the final examination.

A relationship between the classification on the screening examination and the diagnosis on the final examination is a measure of the effectiveness of the screening examination. The proportion

Table 3—Actual and Estimated * Number of Cases and Case Rates of Definite Rheumatic Heart Disease by County and First Impression

County	Classification on Screening Examination			Total	Estimated Case Rate per 1,000
	Normal	Functional Murmur	Suspect		
Caldwell	12(1)	7(2)	2(2)	21(5)	19.7
Durham	0(0)	0(0)	2(2)	2(2)	1.6
New Hanover	0(0)	0(0)	1(1)	1(1)	0.8
Total of 3 counties				24(8)	6.8

* The actual number of cases observed is given in ( ). The preceding number is an estimate of the number of cases in that cell.

Table 4—Actual and Estimated * Number of Cases and Case Rates of Probable Rheumatic Heart Disease by County and First Impression

County	Classification on Screening Examination			Total	Estimated Case Rate per 1,000
	Normal	Functional Murmur	Suspect		
Caldwell	12(1)	0(0)	1(1)	13(2)	12.2
Durham	0(0)	0(0)	3(3)	3(3)	2.5
New Hanover	0(0)	10(2)	3(3)	13(5)	10.4
Total of 3 counties				29(10)	8.2

* Footnote is same as for Table 3.

of cases previously classified as suspects and the proportion of noncases previously classified as free of disease are two such measures. These are calculated by county and total and given in Table 5.

The proportions show that the screening examination in Durham was the most successful in classifying cases as suspect and noncases as free. The screening examinations in Caldwell and New Hanover were fairly successful in classifying noncases as free but the proportions of cases previously classified suspect were rather low, being an estimated 9 per cent in Caldwell and an estimated 29 per cent in New Hanover.

Investigation of Screening Efficiency with Cost Considerations

Some insight into changes in the screening examination that might lead to an increase in the over-all efficiency of the study is given in this section. Efficiency is measured by the number of cases detected per unit of cost. It is assumed that some prior knowledge of changes in the effectiveness of the screening examination relative to changes in its cost is available.

Suppose a screening study has been conducted and the population has been divided into a suspect group and one or more negative groups. The type of doctors and detail of examination will affect the proper classification of individuals into the groups. Adjustments in the amount of money available for the screening examination will enable changes to be made in its ability to classify properly. Thus, an increase in the amount of money for the screening examination might permit either a diagnosis by a more specialized doctor or the use of more expensive laboratory

Table 5—Proportions of Estimated Cases Previously Classified Suspect and Proportions of Estimated Noncases Previously Classified as Free of Disease

County	Proportion of Estimated Cases Classified Suspect	Proportion of Estimated Noncases Classified as Free
Caldwell	3/34 = 9%	947/1033 = 92%
Durham	5/5 = 100%	1161/1203 = 96%
New Hanover	4/14 = 29%	1175/1232 = 95%
Total	12/53 = 23%	3283/3468 = 95%

tests. An investigation can be made into the changes in cost of the screening examination that would lead to an increase in the efficiency of the study.

Consider a population of N individuals, D of whom are cases of disease and N-D of whom are not cases of disease. A perfect screening examination would apportion the D diseased to the suspect group and the N-D other individuals to the negative group or groups. Since this is usually not so, we define

Θ_D = the probability of a diseased person becoming a member of the suspect group ($1-\Theta_D$ = false-negative rate).

Θ_{ND} = the probability of a person who is not diseased becoming a member of the suspect group (false-positive rate).

C_1 = cost of the screening examination per subject.

C_2 = cost of the second examination per subject.

The assumption is made that the second examination, where expert doctors are used and complete laboratory facilities are available, would be perfect in diagnosing the individuals. Also, it is assumed that the suspect group is the only one examined a second time. (In practice, because of the larger proportions reexamined in this group, this assumption is not too restrictive.)

The expected number of cases of disease detected after a population study of the suspect group is $D\Theta_D$ at an expected total cost of

$$NC_1 + \{D\Theta_D + (N-D)\Theta_{ND}\} C_2.$$

Efficiency is defined as

$$\text{Eff.} = \frac{\text{Expected cases detected}}{\text{Total cost}} = \frac{D\Theta_D}{NC_1 + \{D\Theta_D + (N-D)\Theta_{ND}\} C_2}.$$

An increase in efficiency might take place if Θ_D is increased and Θ_{ND} is decreased for an increase in cost C_1 of the screening examination.

To maximize efficiency as a function of screening examination cost C_1, we set

$$\frac{d \log \Theta_D}{d \log C_1} = Z_D \quad \text{and}$$

$$\frac{d \log \Theta_{ND}}{d \log C_1} = -Z_{ND}$$

where

Z_D = percentage increase in Θ_D relative to percentage increase in C_1.

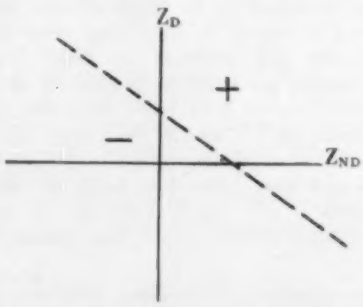
Z_{ND} = percentage decrease in Θ_{ND} relative to percentage increase in C_1.

In the maximization of efficiency, we wish to determine pairs of values Z_D, Z_{ND} that would lead to an increase in efficiency. This can be done by plotting the first derivative as a function of Z_D, Z_{ND}. This leads to

$$Z_D \sim -\frac{K}{K+1} Z_{ND} + \frac{1}{K+1}$$

$$\text{where } K = \frac{N-D}{N} \frac{C_2}{C_1} \Theta_{ND}$$

which is a straight line of the form



A change in the screening process will involve a change in cost C_1 and the probabilities Θ_D and Θ_{ND} and hence will be described by pairs of values Z_D, Z_{ND}. For pairs of values, Z_D, Z_{ND} above the line, efficiency would be increased. For pairs of values Z_D, Z_{ND} below the line, efficiency would be decreased.

To determine the equation for the line, one must have an approximate knowledge of the value of K. This involves estimates of the proportion of the population not diseased, $\frac{N-D}{N}$, of the ratio of the cost of the second examina-

tion to the screening examination, $\frac{C_2}{C_1}$, and of the false-positive rate, Θ_{ND}, for the given screening examination.

It is clear that as K increases the slope of the line increases (in a negative fashion) so that when K is large, almost any pair of values, Z_D, Z_{ND}, in the quadrant of interest where $Z_D > 0$ and $Z_{ND} > 0$ will lead to an increase in efficiency. Thus, it becomes easier to increase efficiency when K is large.

From study of the value of $K = \frac{N-D}{N} \frac{C_2}{C_1} \Theta_{ND}$, one notes that it is easier to increase the efficiency of the screening examination if:

1) C_2/C_1 is high
2) Θ_{ND} is substantial
3) $\frac{N-D}{N}$ is near unity.

To the extent to which all of the above are true for a particular screening examination, the efficiency of the screening examination can be improved if another study is to be conducted. Of course, the amount of improvement will depend upon individual values of the three variables above.

Summary

This paper has been concerned with statistical methods for use in a disease study (with special reference to a study of rheumatic heart disease in North Carolina) where (1) the probability of a case is small, and (2) no adequate diagnostic test exists. It is assumed that a screening examination has been conducted to separate the population into groups with varying degrees of suspicion of having the disease.

Methods are given for allocating a sample size of n to the groups (cost is fixed): (1) to insure that the expected number of cases detected is a maximum: (2) to estimate over-all prevalence rate with minimum variance. In the North Carolina study, the estimated prevalence rate among the sixth grade school children in three counties is 8.2 per 1,000 for children with probable rheumatic heart disease and 6.8 per 1,000 for children with definite rheumatic heart disease.

Finally, some insight is given into the changes in the screening examination that would lead to an over-all increase in the efficiency of the study, assuming some knowledge of change in screening examination effectiveness for a given change in cost is available.

REFERENCE

1. Cochran, W. G. Sampling Techniques. New York: John Wiley, 1953.

Dr. Gehan is assistant professor, Department of Biostatistics, School of Public Health, University of North Carolina, Chapel Hill, N. C.

This paper was presented before a Joint Session of the Biometric Society (Eastern North American Region) and the Statistics Section of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 13, 1957.

A Canadian Nutrition Organization

At a meeting in Queen's University, Kingston, Ontario, in June, the Nutrition Society of Canada was founded with a membership of 90. A provisional committee of persons interested in nutrition research had earlier prepared a list of founding members and drafted a constitution. Membership is restricted to persons concerned with the scientific aspects of nutrition. The society intends to hold annual meetings. Dr. George H. Beaton of the School of Hygiene, University of Toronto, is secretary.

Food is not just a matter of chemicals and calories. Emotions and psychological meanings are also involved. These factors must be considered in any public health program to alter fat in the American diet.

THE PSYCHOLOGY OF DIETARY CHANGE

Walter W. Hamburger, M.D.

THE TITLE of this paper might be paraphrased by calling it "The Egg." Once upon a time an egg was studied by a group of scientists to determine its essential qualities. The biochemist found that the egg contained 250 milligrams of cholesterol. A nutritionist reported that the egg could be converted into 75 calories of body energy. A food technologist said the egg was an admirable dietary item because it could be well preserved by refrigeration. A bacteriologist found the egg to be sterile. A psychoanalyst contested this, saying he had found the egg to be a symbol of fertility. The scientists could not agree among themselves, so they decided to ask a hen. She knew all about eggs, of course, but unfortunately she could not speak; so she could not enlighten the scientists. The scientists then happily agreed that the egg had many qualities and each of them had been correct in his own findings.

The scientists in this nutritional fable emphasized those aspects of food substances which their professional experience had led them to study, using their own technical methods. As a psychiatrist, I study patients' emotional reactions to food. This approach does not contradict biochemical or nutritional aspects of food, but by the same token such a psychologic approach may contribute to fuller understanding of the whole egg.

One young patient of mine could not eat eggs without experiencing abdominal cramps, nausea, and sometimes vomiting. She considered herself allergic to eggs and never knowingly ate them. However, she could develop these same symptoms if she looked at an egg or even if she thought about one. In therapy, she dreamed five times of poached eggs and each time awakened with these gastrointestinal symptoms. Once she got up out of bed and fainted. Ultimately, she discovered that eggs, to her, symbolized conception and that childhood confusion over where babies come from had been carried over into adult fantasies of oral impregnation. To this woman, then, the primary meaning of an egg was as a symbol of impregnation. She was not conscious of this association prior to her psychoanalytic therapy. Yet she had avoided eggs in her diet for this underlying reason—not because of taste, nutritional, economic, or cultural meanings of an egg. No medical, advertising, or other external appeals could have induced this woman to eat eggs. She would have been relieved if any health agency had recommended elimination of eggs from her diet.

I was similarly impressed with the

symbolic meaning of food to a teen-age girl with bulimia. When she was feeling well, she drank large amounts of milk with pleasure. When she went on an eating spree she had a great distaste for milk and preferred to gorge herself on meat. This girl had associated milk with her mother, whom she did not admire. In contrast, meat symbolized daddy's food, and she had always turned to him as the preferred parent. Thus her emotional attitudes toward her mother and father had been unconsciously invested in her attitudes toward milk and meat. After a food binge on meat this patient experienced much guilt and, among other things, would return to drinking large quantities of milk, a symbolic reunion with her mother. At these moments any public health recommendation to cut down on milk intake would have been ineffective for her.

These two illustrations have been chosen to point out the personal, nonnutritional meanings of food to two members of the American public. There is no implication that they are usual samples of our population. Both were emotionally disturbed young women and were therefore in psychiatric therapy. What I do wish to emphasize is that specific foods have important emotional meanings to different individuals. The exact emotional meanings can be understood only in the light of that individual's past life experience.

How do we learn about the symbolic meaning of foods to an individual? I have learned something about them from detailed psychiatric study of patients with clinical appetite and eating disturbances. I first became interested in this as a result of working with emotionally depressed patients, who almost without exception have a disturbance of appetite and body weight.[1] A second source of data has come from work with obese patients, many of whom overeat in relation to certain symbolic, non-nutritional meanings of food and eating.[2,3] Patients with anorexia nervosa also stop eating because of the private symbolic meanings associated with eating and with specific foods. In psychoanalytic work I have also discovered that all patients eventually report dreams concerned with food and eating, whether or not they have a clinical eating disturbance.[6] Their associations to such dreams bring to our attention the emotional significance of specific foods to the individual dreamer. The individual is usually not conscious of these symbolic meanings, which are only inferred through the analysis of food and eating dreams. Conscious attitudes toward specific foods can be more easily approached through questionnaires, food inventories, and attitude tests used by psychologists, nutritionists, and food-marketing researchers.

Kaufman has studied the symbolic meanings of foods in relation to clinical food allergies and has suggested an emotional classification of foods.[7] "Security foods" are those preferred in times of adult stress which recall pleasurable associations of childhood—milk is one. In relation to any program reducing animal fats in the diet, we may note Kaufman's experience with eliminating milk in treating allergic patients. "Many times, I have taken milk out of the diet of a patient who had, in addition to allergy to milk, strong passive-dependent needs. The patients developed symptoms of moderately severe anxiety and hostility toward me. Even though the elimination of milk from their diet freed them from their allergic symptoms, they did not feel well. One patient put it this way: 'I'd rather have my milk and suffer.'" "Reward foods" are those delicacies which adults gave as special treats, as tokens of affection, and as rewards for "good" behavior. These often include desserts, ice cream, and candy. "Fetish foods" are those which we feel we cannot do without and which are invested with special familial, religious, or cultural significance. Examples might be

bread as the staff of life to many people, spaghetti for the Italian, beef to the Englishman, Friday's fish to the Roman Catholic, or turkey at a New England Thanksgiving. Such associations to specific foods are even celebrated in our literature. Meat to many people symbolizes strength and masculinity. We will return to this point when we consider the psychological effect of recommending more vegetable and fish oils instead of animal fats. "Show-off foods" are used exhibitionistically to impress other people. These are invested with prestige and social meanings. They are often unusual or hard-to-get foods like snails or caviar which express the individuality of the person.

These and other categories of foods are suggested by Kaufman's clinical observations. Such categories could well be the basis for a more definitive study of the meaning of specific foods to specific individuals. Such a study would be germane to the public health education program.

In addition to the unconscious symbolic meanings already discussed, there are of course other important factors determining food preferences and acceptability. With others, I share the opinion that the human organism has certain built-in tendencies to eat nutritionally appropriate foods. Clara Davis' classic experiments in dietary self-selection of human infants and young children illustrate this.[8, 9] Curt Richter's work with rats demonstrates the same.[10] Human adults suffering from certain metabolic or deficiency diseases are known to select spontaneously appropriate nutritional substances. Patients with Addison's disease, for example, will spontaneously seek out salt. Patients with functional hypoglycemia often crave sweets. Isidore Snapper describes patients with pernicious anemia who had a craving for beef liver.[11] This is a homeostatic tendency of the organism.

Richter's systematic studies of taste in rats point up another physiologic factor in the determination of food selection.[10] Taste factors in human food preferences are important, too, in considering recommendations for altered fat intake. Palatability of skimmed milk, no butter, or the substitution of fish or certain vegetable oils for animal fats may prove a limiting factor in dietary change for many Americans used to an unrestricted high animal fat intake. It may be necessary to heed the dissatisfaction implied in Gilbert and Sullivan's "H.M.S. Pinafore," when Gilbert wrote, "Things are seldom what they seem, skim milk masquerades as cream."

In human beings the built-in physiologic and nutritional regulators of food choice become altered by environmental experience starting in infancy. This is due to the fact that the human infant is for so long fully dependent on his adult caretaker, in most instances his mother, for nutritional survival. He is really at the mercy of her attitude toward his eating and what specific foods she feels are "good for him." She in turn is influenced by her own personal experience with food and nutrition, by her pediatrician, and by a flood of contradictory dietary advice in every communication medium, as well as by the "hidden persuaders" in advertising and marketing.

There is an increasing body of evidence to suggest that even the earliest response of a human child to food and eating is affected by the emotional climate between the child and his mother. After all, the repetitive experiences of hunger, suckling, and satiation are among the most frequent, consistent, and meaningful experiences in an infant's waking moments. Therefore, the infant soon establishes an association between eating and his emotional relationship to his mother. The other side of this coin is that the mutual feeding experience is also one of the most important bases for the establishment of the infant-

mother relationship. Nutritional satiety for the child is accompanied by emotional satisfaction of both the child and its mother, which contributes to a mutual loving attachment. For all human beings this intimate association of food and mother persists from the cradle to the grave.

As the child grows, he establishes additional emotional associations between food and other members of his family, friends, and cultural groups. It is around the family dining table in childhood that the different emotional meanings of eating and the different symbols of specific foods become established. Food as symbols of parental affection, reward, and punishment, conformity or defiance, competition with siblings, and many other emotional motifs here become invested in specific food and eating patterns. In certain households these associations appear to be more dominant than in others. As examples, consider the economically deprived household, where food has great survival and social values connected with it; the immigrant family whose food selections may reflect strong emotional ties with their native lands; the sick family, where a diabetic parent's diet may be a prime focus of discussion and emotional significance for a young child; a religious family, where food and ritual are combined, as in the strict separation of meat and dairy products in the Orthodox Jewish household; or the broken home, where mealtime for the child may be an unhappy time. All these situations and many others add strong emotional components to the nutritional experience.

The cultural factor as a determinant of food selection is a chapter in itself, and one which I cannot here undertake to present. A sampling of contributions to the literature on the subject is contained in the references.[11, 14-18]

Our American culture is anything but homogeneous, and yet the high fat intake seems to be characteristic. Overnutrition and overfeeding of children seem to be prevalent in this country and are coming in for increasingly critical appraisal.[12] Our high standard of living has been invoked as a common denominator. Another cultural characteristic is our democratic, individualistic way of life, which is also pertinent to diet. This is presumably one reason why the cafeteria, the automat, and the two-foot restaurant menu are so popular here. It may also provide a cultural basis for predicting a very individualistic response to any public health recommendation which might be made as prophylaxis against atherosclerosis.

One cultural factor in the United States that contributes heavily to food selection is the great pressure exerted by the competitive advertising of the food industries. Our supermarkets, ladies' magazines, and daily papers are a dazzle of gastronomic temptations. Our radio and television programs are replete with advice on the best cereals for children, cake recipes, and how much milk to drink a day. A recent book, which has crossed many of your desks as well as mine, has pointed up the value of vegetable oils in nutrition. This was an attractive, up-to-date, scientific, and convincing publication. That it was published by a commercial vegetable firm was tastefully minimized. It makes us realize that while the science of nutrition must pause to ponder, commercial communication and advertising are quick to get into action. We are now informed that in addition to such obvious pressures, to which we have become somewhat inured, we are also being bombarded by more subtle associational and sensory stimuli of which we have not been at all aware.[19] Clearly, any effective public health dietary program led by responsible health educators will have to compete with these "hidden persuaders."

Thus far, we have touched on some of the many factors which determine

food selection. These include the built-in homeostatic nutritional tendencies of the human organism; the physiologic factors of taste and palatability; the influence of early childhood experience, emphasizing the child's emotional relationship to its mother; the importance of the associational and symbolic meanings of food to the individual; and the cultural factors influencing food selection, including the tremendous advertising pressures.

Now let us consider the feasibility of dietary change in the light of these factors. An excellent place to begin is to review the 1941–1943 and 1945 reports of the Committee on Food Habits of the National Research Council.[14, 15] This ad hoc committee was appointed during World War II to advise governmental agencies on nutrition in its relation to national defense. The committee members were experienced and distinguished scientists in the fields of nutrition, physiological psychology, anthropology, sociology, and public health. Only a few of their studies and recommendations will be mentioned, but most of the committee's material is pertinent to the altered fat diet now under consideration.

Kurt Lewin's studies demonstrated the key role of the wife and mother in the selection of family foods. This finding is partly a reflection of the intimate association of feeding and mothering which I have previously emphasized. Lewin also specified four different motives concerned with food choice and dietary change: (1) money, (2) health, (3) taste, and (4) status. He omitted the patriotic motive, which was important during the war years but would not be relevant now. Lewin found that in higher income groups health factors played a more significant role in food selection than in low-income groups where food cost was the guiding factor. This is pertinent to any public education campaign aimed at lowering or altering fat intake for the purpose of preventing atherosclerosis and coronary artery disease. Such a health appeal, if one may extrapolate from Lewin's findings, would be heeded more by higher income groups.

Another important paper in this National Research Council bulletin is that by Hilde Bruch and Marjorie Janis, "Adjustment to Dietary Changes in Various Somatic Disorders." In brief, the authors found that dietary prescriptions were better followed by children (and their mothers) in cases of allergy, diabetes, or epilepsy than in cases of obesity. They explained this on the basis that obese children have a central food problem which involves their entire emotional and intrafamilial life adjustment. To tamper with their diets is to threaten an entire familial equilibrium. Conversely, the nonobese patients were more capable of integrating a new diet into their personal and familial lives. Diet for them is not a central issue. In their conclusion Bruch and Janis make an important speculation: "If one tries to correlate these observations with the problems which face the population at large, one might draw the conclusion that people that are reasonably secure and constructive in their outlook on life would be able to accept a wide range of changes and limitations in their eating habits."

This important inference is borne out by current work on the effectiveness of reducing diets for obese patients. Studies from Cornell indicate that success in following a reducing diet correlates with the degree of emotional stability.[20, 21] Success in weight reduction seemed to be directly related to the apparent emotional stability of the subjects, as judged by the investigators. Of 168 obese patients evaluated and given reducing diets, the 52 per cent with above average emotional adjustment were successful in weight reduction. Sixty-four per cent of those rated as below average emotional adjustment were

totally unsuccessful. Corroboration of this correlation between emotional stability and effectiveness of dietary change is suggested from yet another quarter. A psychologist named Wallen demonstrated that the incidence of food aversions was higher in male human subjects who rated highest on scales measuring neurotic tendencies.[22] Fewer food aversions were found in the least neurotic subjects. Here, again, is a correlation between a wide range of food acceptability and emotional stability.

If one transposes the findings of these studies to our considerations concerning the effectiveness of a recommendation for lower fatty food intake, one may speculate as follows: Recommendations will be most effectively followed by individuals with the greatest emotional stability. In contrast, individuals with evident neurotic patterns may experience greater difficulty in changing their eating habits. This simply makes explicit one of the possible limiting factors in a public health dietary recommendation.

One caution is implied. People who resist dietary change should not be pressured, threatened, or made to feel guilty if they cannot follow the recommendations. Clinicians have learned this from those obese patients who have been threatened and pressurized to follow reducing diets. Such patients usually discontinue treatment, maintain their obese state, and have, in addition, a new conflict because they have not followed the professional advice. Or, if they continue the treatment and lose weight to conform to professional pressure, they experience in many instances emotional symptoms of depression, anxiety, and irritability. Therefore, I believe that any public health campaign is contraindicated which utilizes the threat of serious illness to the person who does not reduce his fat intake.

Another caution comes to mind in considering reduction of total fat intake. As has just been emphasized, the incidence of emotional symptomatology accompanying weight loss is frequent and, in some obese patients, is of important clinical proportions.[2, 3, 5, 23-25] In addition, I have seen a number of clinical depressions ushered in by purposeful dieting which then got out of hand. It would therefore seem ideal if fat intake could be moderately and yet meaningfully reduced, without necessarily causing the individual to lose weight. In other words, I would hope that unsaturated fat substitutes would permit maintenance of usual total caloric intake. If the person is obese, then a reducing diet should be given separate consideration. Moderate fat reduction seems psychologically more conservative and probably more effective than any campaign to lower fat to a minimum. This psychology is in accord with Norman Jolliffe's recommendation for nutritional moderation in what he calls a "heart-saver" diet.[26]

Summary

A moderate reduction in total fat intake, or the substitution of more vegetable and fish oils for animal fats, seems psychologically feasible for large segments of our public—if it is indicated from the metabolic point of view. My hunch is that with an appropriate public education campaign, the desired dietary changes could be effected much more easily than those effected by total caloric restriction for the obese.

On the basis of certain knowledge gained from previous studies of food acceptability and dietary change, we can predict that there will be some limitations to any attempt at altering intake of fat in the diet. Taste and palatability of animal fat substitutes must be borne in mind. Dietary habits of adults are not easily changed, especially by those who are emotionally unstable. Certain cultural groups, as exemplified by an Orthodox Jewish population, will resist

altered fat diets. Whole milk may be given up with difficulty by some people. This was Kaufman's experience with milk-free allergic diets. Milk, as a symbol of one's emotional attachment to mother, may be a food that produces a common reaction resistive to change. Some men, if they knew about it, would probably protest switching from animal to vegetable fats. It just does not sound as manly. Perhaps, however, the manufacturers could quietly make such substitutions without threatening our virility!

There is need for more systematic research in the area under consideration. It would be feasible to study reactions to reduction of animal fats by means of an interview or questionnaire method. A number of professional people have already reduced their fat calories 20 to 25 per cent. Their experiences as to palatability, monotony of the new diet, or any feelings of deprivation could be collected and appraised. Without such definitive studies many of my remarks must remain in the realm of speculation. Nevertheless, I hope my psychological view has contributed to a fuller understanding of the whole egg which we have been examining. If the egg is scrambled at the moment as a result of divergent views, perhaps we can achieve a measure of reconciliation as our knowledge grows.

REFERENCES

1. Hamburger, Walter W. Appetite and Body Weight Changes in Depression. (To be published.)
2. ————. Emotional Aspects of Obesity. M. Clin. North America 35:483, 1951.
3. ————. Psychological Aspects of Obesity. Bull. New York Acad. Med. 33:771, 1957.
4. Babcock, Charlotte G. Food and Its Emotional Significance. J. Am. Dietet. A. 24:390, 1948.
5. Bruch, Hilde. The Importance of Overweight. New York, N. Y.: Norton, 1957, pp. 277-279.
6. Hamburger, Walter W. The Occurrence and Meaning of Dreams of Food and Eating: A Typical Dream. Psychosom. Med. XX:1, 1958.
7. Kaufman, William. Some Psychosomatic Aspects of Food Allergy. Ibid. XVI:10, 1954.
8. Davis, Clara M. Self-Selection of Diet by Newly Weaned Infants. Am. J. Dis. Child. 36:651, 1928.
9. ————. Results of the Self-Selection of Diets by Young Children. J. Canad. M. A. 41:257, 1939.
10. Richter, Curt P. Total Self-Regulatory Functions in Animals and Human Beings. Harvey Lect. 38:63, 1942-1943.
11. Snapper, Isidore. Food Preferences in Man: Special Cravings and Aversions. In "The Regulation of Hunger and Appetite" Roy W. Miner, editor. Ann. New York Acad. Sc. 63:92, 1955.
12. Forbes, Gilbert B. Overnutrition for the Child: Blessing or Curse? Nutrition Rev. 15:193, 1957.
13. Bruch, Hilde, and Touraine, Grace. Obesity in Childhood: V. The Family Frame of Obese Children. Psychosom. Med. 2:141, 1940.
14. The Problem of Changing Food Habits. Bull. National Research Council, No. 108 (Oct.), 1943.
15. Manual for the Study of Food Habits. Ibid. No. 111 (Jan.), 1945.
16. Moore, Harriet B. The Meaning of Food. Am. J. Clin. Nutrition 5:77, 1957.
17. Lee, Dorothy. Cultural Factors in Dietary Choice. Ibid. 5:166, 1957.
18. Keys, Ancel. Diet and the Epidemiology of Coronary Heart Disease. J.A.M.A. 164:1912, 1957.
19. Packard, Vance O. The Hidden Persuaders. New York: McKay, 1957.
20. Darling, C. D., and Summerskill, John. Emotional Factors in Obesity and Weight Reduction. J. Am. Dietet. A. 29:1204, 1953.
21. Young, C. M.; Berresford, K.; and Moore, N. S. Psychologic Factors in Weight Control. Am. J. Clin. Nutrition 5:186, 1957.
22. Wallen, R. Food Aversions of Normal and Neurotic Males. J. Abnorm. & Social Psychol. 40:77, 1945.
23. Bruch, Hilde. Psychological Aspects of Reducing. Psychosom. Med. XIV:337, 1952.
24. Stunkard, Albert J. The Dieting Depression. Am. J. Med. XXIII:77, 1957.
25. Hamburger, Walter W. The Psychology of Reducing. J. Am. Dietet. A. 34:17, 1958.
26. Jolliffe, Norman. Reduce and Stay Reduced. New York: Simon and Schuster, 1957, Chap. XI: A Heart-Saver Diet for the Normal Weight Adult.

Dr. Hamburger is associate professor of psychiatry at the University of Rochester School of Medicine and Dentistry, Rochester, N. Y.

This paper was presented before the Food and Nutrition Section of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 12, 1957.

The work on which this paper is based was conducted at the Strong Memorial and Rochester Municipal Hospitals, Rochester, N. Y., with support from the Foundations' Fund for Research in Psychiatry.

Obesity is not all of one piece. This is the one theme in this article. Furthermore, obesity in some instances is normal, while in others there is a more fundamental underlying disturbance, often psychosocial. Look at the person, not at the scale, is the other theme.

PSYCHOLOGICAL ASPECTS OF OBESITY IN ADOLESCENCE

Hilde Bruch, M.D.

BEFORE DISCUSSING the psychological problems of obesity during adolescence, I wish to make a few general remarks about the condition commonly called—simple obesity. It is customary to discuss this condition as if it were a definite disease entity. This is not so, even though some obvious physiological facts, e.g., that overweight is always the outcome of a positive energy balance, hold true for all cases. Obesity and its allied symptoms (overeating, inactivity, increased fat storage) must be looked upon as the outward manifestations of a variety of underlying disturbances in weight and appetite regulation. It has been amply documented in experimental animals that multiple physiological disturbances are associated with obesity. Even though it is not permissible to apply these observations on animals directly to human pathology, the fact itself, that in human beings one is also dealing with different forms of obesity, is firmly established.

At present biochemical research lags behind clinical knowledge. There is every reason to expect that laboratory tests will soon be available for the diagnosis of different forms of obesity. Obese people differ greatly in their whole development, in their capacity for adjustment and performance in the face of life's stresses, in their eating patterns, and in the stability or imbalance of their weight regulation. The differential diagnosis can be made with a fair degree of accuracy through study of the life history and weight curve, psychological tests, and psychiatric evaluation. These procedures are time consuming; yet until we have simpler methods they are necessary for recognizing the different forms of obesity. Without this effort a rational approach to the whole problem is not possible. Obesity research in the past has been confusing and misleading and current concepts of prevention and treatment are useless and frustrating, and will continue to be so, as long as all cases are lumped together as if they were identical.

Two factors have apparently contributed to the tenacity with which the same errors have been repeated. One is the high regard for statistics in clinical research, because it permits the handling of large figures in an orderly way; however, it neglects individual differences. Overweight lends itself readily to misuse of the statistical method because it is so convenient to speak of "weight norm" and to approach the whole problem in terms of deviation from this norm. Actually, it is a rather useless measurement; knowledge of the stability or fluctuation of weight is much more significant. In the long run, once we

learn to diagnose the different forms of obesity, statistical studies will be needed to furnish meaningful data for evaluating the specific nature of the differences.

The other factor that has delayed constructive work in obesity research is the derogatory cultural attitude toward any, even mild, degrees of overweight. Physicians all too frequently share this condemnatory attitude and their treatment approach by and large has been moralistic, even punitive. A new perspective on the whole problem, a more objective, truly medical view becomes possible only when we step outside the common cultural frame and look upon obesity as a form of adaptation that is intricately interwoven with the whole pattern of life development. Then it becomes apparent that obesity, in spite of its many handicaps, also has a definite positive function which must be recognized before rational treatment can be carried out.[1]

What has been said thus far applies to obesity at all ages. However, it is of particular importance in adolescence, because this age group is most affected by the cultural and social rejection, the more so as obesity itself is often associated with the expression of severe underlying emotional disturbances.

However, not all forms of obesity during adolescence are abnormal. Frequently a certain weight excess is part of the rapid growth and development during puberty. The blossoming of adolescence has always been known and it has been thought of as desirable, until our slimness-conscious attitude began to fight it, creating damaging psychological problems for essentially normal young people.

There are other adolescents for whom being heavy is normal according to their constitutional make-up. As an example take this report of the development of a young man of 28 years of age who had been referred for overweight by his school when he was eight years old. He came from a family with moderate obesity on both sides and with little concern about it. A short effort at reducing was made, but the whole family objected. "We think the bigger he is the better he is." At 12½ years reducing was attempted once more, with a loss of circa 30 pounds. In retrospect he considered this the most miserable period of his life and he felt well only after he regained his former weight. During adolescence he made repeated efforts at reducing, fluctuating between 200 and 225 pounds; there was no progressive increase in weight. He discovered that he functioned better at the higher weight. This man is competent in his work, is married, and has children. Although he does not particularly like being so heavy, his weight has not interfered with a good adjustment.

An extreme of this form of obesity was observed in a boy of Italian descent who weighed 265 pounds at age 11, was able to lose rapidly and easily at the hospital, but would continue to gain, at his previous rate, as soon as he returned to his home. If one plots his various weights on a chart and connects the high points, the weight curve proceeds as if no interference with the natural pattern of his weight had taken place. He weighed 450 pounds at age 24 when he died of pneumonia.

Usually this constitutional form of obesity is of milder degree and is associated with a fairly stable weight. In an unfavorable social climate such young people, in particular girls, are exposed to so much humiliating rejection that the social isolation may precipitate emotional disturbances which in turn may lead to more severe obesity.

In contrast to these forms of "normal" adolescent obesity, there are numerous patients in whom overweight is an expression of emotional maladjustment or physiological pathology. In my experience obesity due to organic causes is extraordinarily rare. I have seen two,

probably three, young patients with obesity following encephalitis, characterized by many changes in behavior, including an uncontrollable desire for food. They would eat whenever food was available, without relation to any recognizable emotional conflict. This eating pattern closely resembles that observed in animals with a hypothalamic lesion for which continuous eating has been described as characteristic. In contrast, in patients suffering from obesity on the basis of psychological disturbances, a relationship between food intake and conflict situations can be demonstrated, though not always on superficial inquiry. This type of obesity may be subdivided into two groups; namely, obesity as an intrinsic aspect of a severe disturbance in personality development and obesity as a reaction to some traumatic event.

The history of a youngster with two distinct periods of rapid increase in weight may serve as an example of this second type. The first increase occurred at age eight and a half after an appendectomy when he had been afraid of dying and the second at age 11 when the specter of sexual maldevelopment had been held up before him. During the following year, on dietary restriction alone, he lost the excess weight and underwent normal puberty. He began regaining as soon as regular contact with the clinic was discontinued. This boy had always been tall and heavy for his age, a feature observed in the great majority of potentially obese adolescents. The short stature of many obese adults is frequently the outcome of early puberal development, which means an accelerated growth pattern, not a delayed one. Evaluation of the psychological background of this boy, as in many other cases, also revealed features which had predisposed him to overreaction in the face of traumatic experiences and to social withdrawal and overeating as a compensatory mechanism.

This reactive form of obesity follows traumatic experiences which are akin to those that are usually accompanied by grief or severe depression; it is relatively rare in adolescence. The more characteristic form is what I have called "developmental obesity" which has its beginning in childhood. It may have been only a mild degree of overweight, or the fatness was accepted with more tolerance than after puberty when the new social and psychosexual demands make being fat a disastrous handicap. It is in this group of youngsters that serious psychiatric problems are encountered, for which reducing is not a cure, but often a danger triggering off more serious mental illness.

This form of obesity must be looked upon as a manifestation of a disturbed way of life, representing an essential aspect of such a person's whole development. The problems of such adolescents offer many parallels and similarities to the premorbid personality problems of schizophrenics. This becomes apparent when we do not focus exclusively on the most conspicuous symptom, the weight excess, but consider also the way these children and young people conduct their lives or, more often, fail in coping with reality demands. Defects of adaptation are recognized on many levels of development, often apparent as an over-all immaturity.

Deficient social relations are usually described by words like "withdrawn," "seclusive," and are "explained" as being due to obesity. Like the schizophrenic, the obese person has an exceedingly low frustration tolerance and will react with sudden withdrawal or undermining hostility to unexpected demands. Associated with this is a sense of helplessness, a conviction of inadequacy, and inner ugliness, derogatory and self-destructive attitudes that are compensated for by flight into fantasies and daydreams. These daydreams of the obese, even of those who offer the façade

of adequate functioning, in certain areas at least, are of an astounding grandiosity and may deal with a transformation of their ugly physique into glamorous appearance, often with change of sex, and with unlimited power over and admiration from everybody. Quite often these fantasies are of sadistic and aggressive nature, in contrast to the placid and cheerful outer appearance and behavior. There is an all or nothing attitude toward life, and when the unlimited knowledge and power are not obtainable, when there is no way of achieving the unrealistic goals, such individuals are apt to give up in sullen despair. However, instead of suffering a schizophrenic break, they will resort to more avid overeating and thus grow still fatter.

Great similarities can also be recognized in the family constellation in obesity and the one which has been considered conducive to the development of schizophrenia. The severe intrafamilial pathology was first reported in 1940 as "The Family Frame of Obese Children." [2] The concepts have since been modified and elaborated in many ways and the essential inner meaning has become clearer in the course of our studies. The outstanding pathogenic factor in these families is the fact that the child is used by one or the other parent, sometimes by both, as a thing, an object whose function it is to fulfill the parents' needs, to compensate them for failures and frustrations in their own lives. The child is looked upon as a precious possession to whom is offered the very best of care, expressed in overprotection, which inhibits the development of muscular skills and interferes with adequate social learning and in excessive feeding. Many parents openly express their dissatisfactions with the sex of the child because the other sex would have better fulfilled their hopes and wishes. The severe confusion in sexual identification which is so characteristic of this group of fat patients can be directly related to these misleading parental attitudes.

As the child grows older the increasing obesity itself becomes the starting point of a new destructive development. A hostile denial of food, in order to correct the state of obesity, results in a shift in the mutual roles. The fat adolescent will refuse to cooperate and in an aggressive self-assertive and self-destructive way demand more and more food—and grow still fatter. He may identify with the demand in an exaggerated way and the picture of anorexia nervosa develops. Or he may give up in the face of an impossible demand and withdraw into the world of schizophrenic unreality. This possibility of a psychotic breakdown, which is by no means a rare occurrence, makes an indiscriminate direct attack on the weight a dangerous procedure.

The futility of reducing without resolution of the underlying problems is illustrated by the history of a man for whom gaining and reducing were the outstanding symptoms of severe maladjustment. For 20 years he had made many efforts with a total loss of more than 450 pounds. He had been a fat child and weighed 265 pounds when he was 16 years old. At that time an older sister took him in hand, insisted on treatment, and supervised his diet; during the next year he lost nearly 100 pounds. But he could not maintain the lower weight. Whenever he was confronted with difficulties in his job or family, with marital discord or illness or accidents, he would gain enormous amounts of weight. Any decision to make a new start in life was associated with reducing at record speed; he would recite the exact figures, like having lost "50 pounds in as many days." The hectic weight curve reflects his many efforts to make a better adjustment. He was haunted by the fear of failure, of not living up to expectations, and the

feeling of being an object of ridicule. He sought psychiatric help when he finally recognized that his problems in living could not be solved by reducing.

In following the development of a large group of obese children into adulthood, an embarrassing contrast between the amount of medical and dietary treatment and the later adjustment became apparent. A favorable outcome, that of slenderness or moderate obesity with good social adjustment, was achieved by those who had the least amount of medical attention, no endocrine injections, and no enforcement of dietary restrictions. These patients had established control over their weight during adolescence, or in early adult life, on their own initiative, with a constructive goal and without outside compulsion. This group can make use of dietary reeducation. In the other groups, efforts to enforce dieting had precipitated constant fighting in already overstrained families, or the hardship of dieting, even when self-imposed, had reenforced existing psychological problems. The outcome was an unfavorable total development, in spite of temporary weight loss.

Even poorer was the effect of continued endocrine treatment. The patients who had received the largest amount of endocrine products were suffering from the more severe forms of mental disturbances. This, of course, was not produced by the endocrine injections. Parents who are dissatisfied with or anxious about a child's atypical development will continuously search for the kind of treatment that promises to alter or transform the child and they are apt to resist an approach directed at their own disturbed involvement. Such continued pressure and discontent may become manifest in a child as severe mental illness, even as psychosis.

Familiarity with these facts is of great practical importance for the management of obesity. The notoriously poor cooperation of fat adolescents and the inevitability with which many regain the painfully lost weight is related to failure to recognize the functional importance of the excess weight which can and should not be removed until the underlying problems have been corrected.

I am aware that the observations and opinions expressed here run contrary in many ways to the prevalent attitude. They certainly do not offer an easy solution in terms of the public health approach. But we cannot neglect the sad fact that for many fat youngsters the alternative to be achieved through reducing is not that of becoming a beauty queen or sports hero, but that of being a mental patient. It may sound paradoxical but reducing is not the cure for obesity. It becomes possible only after considerable improvement in the total adjustment has been achieved. The ability to reduce is only a confirmation that such improvement has taken place.

To be of real help to obese adolescents a more respectful and understanding approach to their problems is essential. There is need for a new type of public education about overweight, namely approaching it without insulting the dignity of people who are in need of help. Only in an enlightened social climate has the struggling obese adolescent a chance of solving his problems and of living in a constructive way.

REFERENCES

1. Bruch, H. The Importance of Overweight. New York, N. Y.: W. W. Norton and Company, 1957.
2. Bruch, H., and Touraine, G. Obesity in Childhood; The Family Frame of Obese Children. Psychosom. Med. 2:141 (Apr.), 1940.

Dr. Bruch is associate clinical professor of psychiatry, Columbia University, College of Physicians and Surgeons, and attending psychiatrist, New York State Psychiatric Institute, New York, N. Y.

This paper was presented before a Joint Session of the Food and Nutrition and Maternal and Child Health Sections of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 14, 1957.

In handling cases of ordinary exogenous obesity, dietary treatment has to be used. However, this must be done with a recognition of the psychological elements and possibilities involved. Furthermore, according to Dr. Lowrey, education of the patient and the family is important.

OBESITY IN THE ADOLESCENT

George H. Lowrey, M.D.

OBESITY MAY be encountered at any age in pediatric practice and a discussion of this subject should probably not be limited to one age group. Many overweight adolescent children were overweight as younger children. However, it is true that the adolescent is more prone to develop obesity and the parents of these children are more sensitive about the obesity as it occurs at this age. Wilkins,[12] at Johns Hopkins Hospital, quotes figures to show that this is probably the most common entity that he sees in his endocrine clinic. Our own experience at the University of Michigan Hospital would support this and certainly obesity is one of the most common complaints with which the pediatric endocrinologist is concerned. A recent public school survey in an eastern city demonstrated that between 10 per cent and 20 per cent of all high school children may be considered overweight.

Obesity is difficult to define, because the definition will vary in different cultural environments and will also vary to some extent with race, genetic background determining body type or habitus of the individual, and with the statistics or figures used to determine the degree of overweight of the individual. Most of the standard charts for height and weight which have been assembled within the last 10 years would indicate that any child weighing 20 per cent above the mean for his height and age would probably be considered obese.

I would like to mention briefly the prevention of obesity and to emphasize in this regard that plotting the progress of a particular child on any one of the numerous growth curves that are now available will often reveal a trend of the patient which is perhaps not apparent from individual statistics of his height, and weight, and age. This method may not only be revealing to the physician, but it is also of great help in showing the parents that the child is beginning to deviate from the average growth curve. These charts will often convey information very graphically to the parents, and make them realize better what is going on with their child, than to sit down and talk to them for 30 or 40 minutes. These charts or graphs thus become useful preventive measures when the first signs of obesity begin to appear.

It is of particular interest that approximately 50 per cent of the children we see have one or both parents who are considerably overweight. Some investigators have felt that there may well be a genetic factor involved in the obesity. As yet there is insufficient information to establish any hereditary or genetic factor in obesity. As is true in so many other growth and developmental

problems in children, it is often difficult to separate genetic from environmental factors, and this would seem to be particularly true in the field of obesity.

As a former student of Dr. Harry Newburgh, I always like to emphasize that children obey the law of the conservation of energy. Dr. Newburgh, many years ago, established the fact that the only way an individual increases his weight is to take in more calories than he is expending. He also emphasized that there is seldom any primary metabolic abnormality in patients who are overweight, and that if they will decrease the caloric intake all of them can reduce their body weight.

Now let us turn to the general classification of causes. Hypothyroidism as a factor in obesity is extremely rare. Many authors say they have never seen a truly obese hypothyroid child. Wilkins states that he has seen only two obese children in over 200 with definite hypothyroidism. The most important thing to stress, relative to hypothyroid individuals, is the fact that they are never of normal height for their chronologic age. The average obese child who is overweight because of excessive intake of calories is nearly always above normal stature for his chronologic age. I would also like to condemn the use of basal metabolic rates in children as a means of measuring anything, and especially measuring the true metabolic rate of the individual. First of all, we have no really accurate standards to use. It is not common knowledge that in the childhood years there have been measurements of the body surfaces of only about five or six normal children. In spite of this lack of adequate background the most commonly used standard in metabolic measurements is that of body surface. Second, this is often a frightening procedure to any child. It is the usual thing for a physician or a technician to run one or two tests on a child who has been rudely awakened in the morning. He has to go without breakfast to a hospital with strange smells and often an association of unpleasant memories. A rubber tube with a horrible taste is thrust in his mouth. An unpleasant clamp is fastened securely to his nose. He is then admonished to "breath normally." Under such conditions a basal level is indeed difficult to achieve. Laboratory tests, such as the serum protein-bound iodine, and the radioactive iodine uptake over the area of the thyroid gland are very useful tests to determine thyroid function. Both are much more reliable than the BMR or serum cholesterol in determining thyroid function.

Cushing's syndrome is another very uncommon form of obesity and is usually associated with such other findings that there is very little difficulty in separating this from the usual type. Classically these children are not only obese but also considerably dwarfed. In addition, they have hypertension and often a considerable degree of hirsutism and sometimes actual sexual precocity. Relatively simple laboratory tests can be performed on these patients to confirm the diagnosis. These include a glucose tolerance curve which would show a diabetic type of response, as well as determinations of steroids in the urine where they are elevated above normal.

Another type of obesity which is frequently said to be present in children, or at least a frequently used term, is Fröhlich's syndrome. This entity was first described in 1901 and there have been very few proved cases reported since that time. However, I estimate that the title has been used as a diagnostic appendage to obese children many thousands of times. As Dr. Bruch [1] has so amply pointed out, the diagnosis should be limited to a very specific entity, namely, to a child with a lesion involving the area of the hypothalamus of the brain and causing the following symptoms in addition to obesity—failure

of vision, headaches, vomiting, and shortness of stature associated with lack of sexual development. Again, one can state that almost aways the patients with lesions of the hypothalamus manifest other important findings, so that this type of obesity can be differentiated from the "run-of-the-mill" seen in our clinics. To my knowledge, none of these children have been of normal stature for their chronologic age. Nearly all of them show some evidence of neurologic damage, such as those listed, and sometimes further evidence such as severe mental retardation or convulsive disorders. Probably we can place in the same category those groups of children who have obesity associated with mental deficiency, although I think the psychological factor plays a part here, in that one of the few methods of self-satisfaction for these children is to overeat. Still another group that probably would fit into this category is that with the Laurence-Moon-Biedl syndrome. In addition to obesity, they have severe mental retardation and usually other findings, most notably, syndactylism and the retinitis pigmentosa found in the eyes.

These would be the usual types that one might confuse with so-called ordinary exogenous obesity. Again I wish to point out that the combination of a careful history and physical examination will quickly discover these conditions. All these together would probably make up less than 1 per cent of the total cases of obesity seen each year.

This brings us to the adolescent overweight child, who is obese primarily because he takes in more calories than he uses up. The time of onset of obesity in most of these children is about eight or nine years of age, although some will begin before or after this time. In relationship to the preventive factors mentioned before, it might be helpful if therapy were started at this time rather than later. However, it takes considerably more skill on the part of the therapist to interest the patient in his obesity at this time as compared to the older group. It is always amazing to see children referred by physicians as having a glandular abnormality, particularly boys because the penis and testes are "too small." There is little question that they are small relative to the large size of the trunk, but usually if the fat pads are pushed backward over the pubis it will be seen that these external structures are quite normal in relative size for the chronologic age of the child. It should be remembered that the genital organs undergo practically no growth from the second year of life until after the preadolescent growth spurt is under way.

So far as therapy is concerned, it is extremely important to determine the reason why these children take in more calories than they use. Surely, the relationships that the child has with the parents, in his school, with his friends, and with society in general play a very important part. I am equally sure that this peculiarity does not begin at the age of nine or at the age of 14 when the child is first brought to the attention of the physician. Often the pattern is set in early infancy with the anxiety on the part of the parents in the feeding of a new child, or in the feeding of a child three and four years of age who has begun to lose his rotund baby look, and has less interest in food. The parents become worried and try to force food. Unfortunately, this kind of behavior by parents often persists for many years. Until one uncovers these emotional factors that are the cause of obesity, we will have little success in treatment.

I frankly doubt that the lack of exercise by children plays a very large part in causing obesity. The lack of interest in active sports that many of these children display is a part of the total picture of disinterest in all activities except eating; at least this seems to be true in most instances. On the other hand, a

few obese boys find themselves well accepted when they get into junior high school and high school because they make excellent linebackers on the school football team. Other physical factors such as illness, including rheumatic fever and poliomyelitis, which require long periods of convalescence, may occasionally play a part because of the forced decrease in activity.

From a purely physical standpoint, then, the diet becomes a very important part of treatment. It is necessary that the child have some desire to go on this diet and that it should not only be the wish of his parents. It is essential that the parent and/or the physician instill in the child some desire to stay on his diet. I do not mean that he simply have a wish to lose his excess of weight, because most of the children will quite freely express their desire to do this, but not all of them are willing to take the necessary steps to achieve this goal.

There are two more important things relative to treatment with diet. First of all, the child should be reassured that there is nothing wrong with his glands. Having reassured him of this it is quite proper to instill a bit of anxiety with regard to his weight, and to explain the rationale of dieting. It has been stated that one should be extremely careful about urging diet on a child who already is going through the prepubescent spurt of growth when his body has great requirements. We have never tried to put our children on such a severely restricted diet that this was any real problem. What we have usually done is to take the history from the parent and the child and to try to come out with some type of a diet appropriate to the degree of activity that the child has and to the family's cultural pattern. We try to give him the satisfaction of sampling all types of foods, including a few desserts, and finally, to give a diet which will cause moderate loss in weight. It is important to warn the child and the parents that we are not going to put him on such a strict diet that this loss of weight will be very rapid. Some physicians have objected to this liberalization of a restricted diet on the basis that the child is going to cheat, and he does not have to cheat very much before he is right back where he was in the first place. However, we feel that an extremely strict diet may be detrimental to the physical development of the child, plus the fact that he often feels so terrible and this becomes so much of a chore that the whole idea of eating becomes very much of an obsession with him. Occasionally, for psychological reasons, we may desire a fairly abrupt weight loss, but the necessary restrictions are maintained for only a brief time. It is important that the child return at fairly frequent intervals, so that the physician can be guided as to how long the diet should be continued, what changes might best be made in the diet from time to time, and also because of another important factor, namely, to continue the relationship between the doctor and the patient so that the child will get encouragement when he needs it and a bit of discipline when this is necessary.

In our experience there is little place for drugs in the treatment of these patients. So-called anorexic drugs, such as amphetamine, have been of limited or no value. We have tried these in all possible doses with no lasting effect. Since thyroid disease is seldom a cause of obesity in childhood, thyroid is rarely indicated in treatment. It should never be used unless there is very definite indication of thyroid deficiency. The indiscriminate use of thyroid is fraught with many difficulties. First, it leads the child and parent to feel that there is truly some glandular deficiency. Second, it often leads to the false hope that here is a magic cure for this child's difficulties. Furthermore, it rarely reduces weight even when relatively large doses are used. Some have advocated

the use of thyroid or other drugs simply as a type of placebo to satisfy a certain psychological necessity. This indicates that the physician is not willing to spend enough time with the patient to find the real cause behind the obesity and to treat this correctly. The gonadotropic hormones are completely without rationale in treatment and I wish to emphasize that stimulation of the gonads in the preadolescent boy or girl is a potentially dangerous thing to do. I mention it only to condemn it. Testosterone therapy falls into the same category.

In conclusion, I wish to stress that by far the most common cause of obesity as seen in the adolescent is due to the increased intake of food, and possibly a relative decreased output of calories in the form of exercise. The cause for the excessive intake of food is usually one or more of several psychological possibilities. As a guide to therapy, it therefore becomes necessary to devote enough time to obtain a good history of the variety of factors that may contribute to overweight in any given patient. It is important to instill attitudes of some degree of moderation in young mothers toward the intake of food and the gain of weight in early infancy. They might be given some information on the normal growth and development of a child so that unnecessary fears can be allayed early in the child's life. The recognition of excessive gains in weight may be modified at this time rather than to allow them to continue into later adolescence when it may be much more difficult to obtain good results. True glandular obesity is extremely rare and it is usually easily recognized when it is present. Finally, I believe that diet plays an essential, but always secondary role in the treatment of obesity. The most important part is establishing a good relationship between doctor and patient and finding out why the patient takes in more calories than he needs. A proper diet is often helpful to such children, but a diet need not be so severe that one has to worry about actual deficiencies in the important food substances, whether proteins, carbohydrates, fats, vitamins, or minerals. To paraphrase an aphorism—treat the patient, not his weight.

REFERENCES

1. Bruch, H. Physiologic and Psychologic Aspects of the Food Intake of Obese Children. Am. J. Dis. Child. 59:739, 1940.
2. ————. Fröhlich Syndrome: Report of Original Case. Ibid. 58:1282, 1939.
3. ————. Psychiatric Aspects of Obesity. Metabolism 6:461, 1957.
4. Childs, B. Familial Aspects of Obesity. Pediatrics 20:547, 1957.
5. Gordon, H. A Summary of Some Clinical Aspects of Obesity. Ibid. 20:556, 1957.
6. Hill, L. F. Obesity in Pediatric Practice. Ibid. 20:540, 1957.
7. Hoffman, R. H. Obesity in Childhood and Adolescence. Am. J. Clin. Nutrition 5:1, 1957.
8. Johnson, M.L.; Burke, B. S.; and Mayer, J. Relative Importance of Inactivity and Overeating in the Energy Balance of Obese High School Girls. Ibid. 4:37, 1956.
9. Johnson, M. L.; Burke, B. S.; and Mayer, J. The Prevalence and Incidence of Obesity in a Cross-Section of Elementary and Secondary School Children. Ibid. 4:231, 1956.
10. Norman, J. M. Treating Obesity in Children. Am. J. Dietet. A. 30:695, 1954.
11. Sebrell, W. H. Metabolic Aspects of Obesity: Facts, Fallacies, and Fables. Metabolism 6:411, 1957.
12. Wilkins, L. The Diagnosis and Treatment of Endocrine Disorders in Childhood and Adolescence (1st ed.). Springfield, Ill.: Thomas, 1950.
13. Young, C. M.; Moore, N. S.; Berresford, K.; Einset, B. M.; and Waldner, B. G. The Problem of the Obese Patient. Am. J. Dietet. A. 31:1111, 1955.

Dr. Lowrey is associate professor of pediatrics, University of Michigan School of Medicine, Ann Arbor, Mich.

This paper was presented before a Joint Session of the Food and Nutrition and Maternal and Child Health Sections of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 14, 1957.

The importance of records and record systems is generally acknowledged. Here is an account of what goes into a good system. The application of this system is described in the article that follows this one.

THE ROLE AND USE OF CODES FOR COMPILING SERVICE STATISTICS

John J. Freysinger, M.B.A., M.P.H., and F. M. Hemphill, Ph.D., F.A.P.H.A.

A REVIEW of the literature and the programs of past APHA meetings will show that, like the quest for the fountain of youth, the search for a record system that provides all the necessary information at little or no cost in money and personnel time is a continuing one.

It is a rare opportunity to receive a request, as Dr. Hemphill and I did, to work with a group of nurses from a progressive local health department for the purpose of reviewing and evaluating the ability of its record system to meet its information needs. The paper by Krause and Vaughn that follows discusses in some detail the system that was designed as a result of our review and the procedures developed for analyzing the data gathered. As a preliminary to their paper, I shall discuss the use and utility of codes for reporting local health department service statistics.

Too many health departments continue year after year filling out records, hiring clerks to file them away methodically, and worrying about the space needed to store the records. Then, when they need specific information, a program for gathering it is started as a special project, either because of the difficulty in abstracting information from the files or due to the fact that the gathering of the necessary information was not provided for in the record system.

The lack of understanding on the part of health department personnel of the need for gathering information is exemplified by such statements as "Records are necessary to give health department employees something to do between visits," or, "We need this information to complete that report for the state health department." Demonstrating more understanding are statements like, "Accurate information about health department activities increases the possibility of securing an adequate operating budget." We may add to the list of information needs such statements as, "Adequate information permits objective work load distribution," and "Information permits assignments of priorities for funds and personnel among health department programs." If we are ever to reach the goal of compiling accurate and complete statistics on services rendered by health departments, health department personnel must be informed of the value of information of this type.

Unfortunately, the number of people working in the field who have a thorough understanding of the characteristics of an adequate and workable record system is too small to permit a rapid extension

of proved systems in local health departments. In addition to an adequate record system, it is necessary to have people who have the knowledge and interest to record information accurately and to summarize and evaluate the information that is gathered into reports for the use of supervisory personnel. It follows that the supervisory personnel must have the ability to assimilate the summarized information and use it to improve the operation of the health department.

The trend in local health departments is not in the direction of securing personnel trained in data gathering and processing skills, but rather, as in the past, an attempt to give clerical personnel some meager on-the-job training in the area of information processing. The less skilled the personnel who summarize the data the more efficient the record system must be in terms of producing, through a simple predetermined procedure, the information required. The record system must be simple to operate for the professional staff personnel who are recording the basic information, and it must be designed in such a manner as to permit categorization of information at the time of original entry on the recording forms. The system must also be designed in such a manner as to permit easy routine abstracting of information for report building and should, insofar as possible, satisfy other criteria of an adequate record system, including the following: The system must (1) produce valid information; (2) demand as little professional personnel time as possible; (3) serve inter/intradepartmental communication needs; (4) supply the necessary information for permanent individual, family, and establishment files; (5) should be designed to permit flexibility in terms of expanding or contracting the amounts and types of information to be gathered, without requiring a complete revision of the system; (6) should require that information be recorded as soon as possible after the service has been rendered; (7) should be designed to permit current abstraction of information from the basic records; and (8) must demonstrate economy in light of the information gathered and of the uses to which it is put.

The success or failure of a given system in meeting these criteria depends to a large extent on the ability of the designers to produce a specific, comprehensive, and workable code. Our everyday use of the word, code, to represent this important phase of record keeping is, in my opinion, a misnomer. In my experience a code using a specific definition is a listing of numerical or alphabetical symbols assigned, for identification and processing purposes only, to predetermined categories of information which define areas and instances of services rendered by health department personnel. If this definition is correct, that a code is merely a set of symbols, then it is the listing of the predetermined categories that is important and not the code, per se. We are beginning to see evidence that this fact is being recognized, since more and more often we hear discussions and see references to "classification lists" rather than to "codes." If we recognize that a code is basically a classification list with identification symbols assigned, then the word takes on more meaning and more accurately defines the actual situation. Subsequent reference to a code in this presentation bears the foregoing connotation.

The preparation of a coded classification list, then, is of paramount importance in producing adequate service statistics on the local level. The design of the record forms should assume its proper place, a secondary one, since the record forms are merely the vehicle which permits the use of the coded classification list. Failure to recognize

this very important point may account for much of the confusion and inadequacy we see in present-day record keeping. Too often the first step undertaken in reviewing or establishing a record system is to start designing forms. This should be the last step, after all other planning has been accomplished, and may best be handled by calling in a good forms salesman who is experienced in the business of forms design.

As previously indicated, the first step in revising or designing a record system to fit specific information gathering needs should be to tackle the job of determining these needs and establishing the classification list that will provide the required information. A few minutes' reflection about the numerous types of information necessary to record a specific activity by a public health nurse should make it evident that a single classification list would not be satisfactory. Rather, it is necessary to break the specific activity into its several component parts, relative to the total amount of information necessary to record the service adequately. In the situation described by Krausé and Vaughn, a classification list defining "activity," another for "patient classification," a third for "status of case," and finally a list defining "health department programs" was produced.*

The establishment of these lists as a first step in the development of a record system is of immeasurable value, since it forces the designers to carry out a complete review and itemization of the specific categories of information needed within the broad information areas being considered. At the same time the designers must trace and develop the entire procedure of processing a single bit of information, from the time it is originally recorded until it finally ends up in a summary report. This process necessarily produces continuity within the record system and, if planned successfully, makes possible the production of useful summary reports using relatively unskilled personnel in the data processing activities. The use of relatively unskilled personnel is warranted by the fact that decisions regarding categorization of information are made at the time the lists are compiled and the information is assigned to the proper category at the time of original entry, not when the summary reports are being abstracted. The need for making careful, considered decisions regarding categories to be included or excluded in the separate classification lists cannot be overemphasized. Further, the arrangement and sequencing of items within the lists to permit various degrees of grouping information for summarization is extremely important.

Once the classification lists have been compiled and reviewed the next logical step is to assign the code symbols, which in this case are numbers. The use of numbers rather than alphabetic letters, plus and minus signs, and so forth, is preferred, since the language of most data processing systems is composed of numerical symbols. Here, again, planning and thinking through the entire data processing procedure from beginning to end is extremely important. Too often code numbers are assigned to a classification list beginning with the numeral, one, and continued through a straight numerical sequence to the end of the list. This method does not make provision for including additional items in the list as necessity dictates, nor does it make adequate provision for pregrouping classes of items within the list by numerical sorting. A much more satisfactory system is one in which each digit position of a given numerical value identifies a specific information area or group. The International List of Causes

* See the article in this Journal immediately following.

of Death * is an excellent example of this type of code and is the one with which most health workers are probably familiar. Consistently, the hundred's position of the code numbers of the International List identifies a broad disease group, the 10's position identifies a subgroup within the broad grouping, and the unit's position identifies specific diagnostic categories. Insofar as possible this general coding scheme was followed in the code for the Nursing Department of Wayne County, Mich.

Anyone who has been faced with the almost insurmountable task of abstracting statistics from records which contain information in longhand will realize the inadequacy of this method of recording. Only a slight improvement results from the procedure requiring each field worker to record to gross categories the numbers of visits made during a day's work. A well known example of this type of recording is the daily activity sheet. A simple count of the numbers of visits made in the Maternal and Child Health Program is far from satisfactory without such essential additional information as age, sex, locality, specific area of service within the MCH program, and so forth in a form that permits easy and rapid summarization. Neither is the explanation that this type of information is in the family folder of any help, since we cannot afford the personnel time to abstract it. If we could afford it, of even greater importance is the fact that the statistics would undoubtedly be inaccurate if compiled by nonprofessional personnel reading the family roster sheets and nurses' narratives and trying to determine the proper categories to which certain items of information should be recorded. Proper categorization of information is necessarily the responsibility of the professional person rendering the service and this person should record the information as soon as possible after the service is rendered, when all the facts pertaining to the visit are fresh in his or her mind.

If the basic information is originally recorded and identified according to predetermined and defined categories of information, its summarization then becomes a matter of routine dictated by written procedure for data processing within the health department unit or by a processing unit set up to serve the entire health department. The probability of obtaining valid and usable summary reports is increased greatly and will be further enhanced if adequate codes are available and are used in the original entry phases of information gathering.

The use of specific, well thought out codes for recording and processing service statistics should produce at least the following advantages:

1. If the classification list is specific enough—and there is more danger of being too gross than there is of being too specific—the problem of deciding where to code a given service is minimized. Therefore, more valid information will be recorded at the time of original entry.

2. Recording of information as code symbols rather than in longhand provides for ease of recording and assures a constant meaning for the information recorded, since the code symbols represent a constant definition of a specific information area.

3. The necessity of completing a predetermined code series assures that all pertinent information will be recorded for each service rendered.

4. The use of specific codes, eliminating insofar as feasible the opportunity to record in longhand, saves recording time and increases the probability that information will be recorded soon after the service is rendered.

5. The use of code symbols, and their ability to represent specific and concise ideas and definitions, lends continuity to summary reports abstracted on a routine basis.

6. The use of code symbols provides for ease in abstracting information from the basic record forms and permits more timely compilation of summary reports.

7. Any given code, if the code symbols are

* International Statistical Classification of Diseases, Injuries, and Causes of Death (Sixth Revision Adopted 1948, Vol. I). Geneva, Switzerland: World Health Organization, 1948.

in the correct language, will lend itself to use in any record system, e.g., hand tabulations, marginal punch cards, mechanical punch card systems, and so on. This is a real advantage. Very often, as a department grows in size and number of services rendered, it outgrows its data system of processing. The opportunity to retain the code when it becomes necessary to introduce a more extensive data processing system is of immeasurable value.

8. The use of specific codes for recording original information permits more extensive and comprehensive report building. The opportunity to produce these reports, coupled with an increased ability on the part of health department personnel to assimilate and utilize the additional information available, of itself should offer many advantages from the standpoint of administrative control of the individual units and of the health department as a whole.

Whenever we introduce a change from the normal and accepted routine of performing our daily tasks we are almost certain to meet with resistance on the part of some of our fellow workers. However, with rare exceptions, we found the public health nurses of Wayne County cooperative, interested, and more ready to try something new than some of the other professional groups in public health. This cooperation will be forthcoming especially if they are given the opportunity to work on the development of the system and are kept informed as to the progress being made and the reasons for making the suggested changes. Surprising as it may seem, learning to use the rather extensive codes developed by Wayne County was not a major problem during the introductory period of the new record system. Instead of finding it a problem, many of the nurses volunteered the information that the chore of record keeping had been lightened considerably and that this was due in large part to the fact that meaningful codes had been made available.

The need for improved record keeping and data processing in public health does not require restatement. Like the weather, everyone talks about improving records in health departments, but not many are actively seeking these improvements. I am convinced that with the knowledge now available it is possible to design a record system to meet any specific information gathering need. Progress toward more adequate record keeping, data processing, and utilization of the information gathered is hindered only by lack of appreciation of the need for such information on the part of health department personnel and their inability to put it to work for them. As the need for information is more strongly felt, and as the personnel in public health improve their ability to use data, record systems to provide the necessary information will be forthcoming. The basis of these improved systems will be codes that have been adequately planned and tested, representing lists of defined categories of information arranged within appropriate topical classifications and identified by readily manageable numerical symbols.

Mr. Freysinger is superintendent of Beyer Memorial Hospital, Ypsilanti, Mich., and assistant professor at the University of Michigan School of Public Health. Dr. Hemphill is professor in the Department of Public Health Statistics, University of Michigan, Ann Arbor, Mich.

This paper was presented before a Joint Session of the American Association of Registration Executives and the Health Officers and Statistics Sections of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 12, 1957.

This is a description of the actual situation in which the principles discussed in the preceding article are applied. The value of an adequate record system is demonstrated.

DEVELOPMENT, APPLICATION, AND EVALUATION OF THE WAYNE COUNTY PUBLIC HEALTH NURSING RECORD SYSTEM, WITH AN ANALYSIS OF THE STATISTICAL METHOD USED

Amalia G. Krause, R.N., M.P.H., F.A.P.H.A., and Irvin R. Vaughn, F.A.P.H.A.

WAYNE COUNTY is located in the southeastern tip of the State of Michigan. There are two full-time health departments, that of the City of Detroit and that of Wayne County. There are six part-time health departments that have part-time private physicians as health officers but have full-time nursing staffs. The Wayne County Health Department extends supervisory and consultant services to the part-time health departments and gives direct service to the remaining out-county area. This area includes 34 governmental jurisdictions and 37 school districts. The number of occupied dwellings has increased 59 per cent since 1950 and there has been an average yearly increase in population of 42,000. All the problems of suburbanization are encountered.

There are 51 budgeted positions for the Division of Public Health Nursing. No new positions have been added since 1951–1952, except through contracts between the Health Department and local governmental jurisdictions or local boards of education. This division gives generalized public health nursing services and includes the school health program. Bedside nursing is done on an emergency or demonstration basis.

Need for More Specific Service Statistics

As demands for service increased and the number of budgeted positions remained static, it became increasingly necessary to determine and establish priorities of service and to equalize the distribution of nursing time by program and geographic area. This proved to be impossible because of the grossness of the available service statistics. For example, we knew only that so many thousand home visits had been made to communicable disease patients; or we knew only that so many thousand antepartum visits had been made; and in most cases we had no idea whether we were seeing antepartums in their first trimester or in their third trimester.

There were three distinct needs for more detailed and accurate service statistics: (1) to provide data so that sound priorities of service could be established; (2) to provide data to permit objective distribution of nursing time; and (3) to provide data to be used for program and performance budgets.

We are of the firm conviction that accurate information about health department activities and costs increases

the possibility of securing an adequate operating budget.

Development and Application of Record System

In 1954 we were without the full-time services of a qualified statistician; therefore, consultant services were obtained from the University of Michigan School of Public Health. Two consultants met with the nursing director and the medical director. Conferences were held at first with this administrative group to determine the kind and amount of statistics needed to meet the needs previously outlined. It was determined that a record system must be specific enough to allow for the development of a program and performance budget. It was also determined that statistics must be kept by geographic area so that cost of services to a given community could be ascertained. The nursing supervisory staff was then brought into the planning and a very short time later six staff nurses from six typical areas were added to the group. These staff nurses were selected because they had a variety of experience and a liking for records. The health officer, the nursing director, nursing supervisors, and the nursing field and clinic staff each submitted a list of the kinds of information which they felt they needed in order to do more efficient work. There was unanimity of agreement that the record system should be the most simple form which would: (1) allow brief, pertinent information to be recorded immediately after the service was performed, thus eliminating the backlog of records; (2) provide for the elimination of duplication through the multiple use of records; (3) provide specific statistics on amount of service given in each area; and (4) provide information regarding total services to school-age children.

As the group considered the detailed information desired, it became apparent that this could best be accumulated through the use of a classification or code. The planning group was divided into several small subcommittees, each working on one particular phase of the service program. For example, one subcommittee, which included the health officer, considered the communicable disease control program and other disease conditions. Another subcommittee considered the maternal and child health program. As various subcommittees submitted their reports to the whole planning group it became apparent that the desired information fell into four major categories: Activities, Status of Case, Patient Classification and Program—Activities were divided as follows:

1. field,
2. office,
3. training, education and professional,
4. miscellaneous.

Status of the case was divided into two major sections:

Type of Visit

1. Admit
2. Revisit
3. Closing visit
4. Readmit
5. Single visit service
6. Closed without visit
7. Not applicable

Condition of Patient

1. Acute condition
2. Chronic condition (disease present)
3. Handicapped
4. Suspect
5. Contact
6. Carrier
7. Not applicable
8. No apparent disease
9. Patient deceased

These two sections relate to each other. For example, a coding of Nos. 1–1 indicated an admitting visit to a patient with an acute condition.

Patient classification was divided into the following categories:

1. Antepartum
2. Postpartum

3. Infant
4. Preschool
5. School
6. Adult
7. Family
8. Community
9. Not applicable

The first three categories were subdivided to provide more specific data, e.g., the antepartum patient classification was subdivided into primipara, first, second, and third trimester; multipara, first, second and third trimester. There was no available information to assist us in determining the value of home visits to antepartums. Were most visits made to primiparas in their first trimester, as we desired, or were they mainly to multipara in their last trimester?

Program code was divided into the following major categories, each of which was further subdivided:

1. Communicable disease control
2. Diseases and conditions
3. Maternal and child health
4. Health supervision
5. Environmental health
6. Accidents
7. Mental health
8. School health
9. Administration
10. Supervisory and staff education program
11. Student program
12. Clinics—outside of school program
13. Evaluation of care centers
14. Programs with other agencies
15. Civil defense

Only after each program had been defined and subdivided was the slightest consideration given to the process of assigning numerical values to each item in the classification or code. Then, a block of numbers was designated to each major program. Care was taken to leave unassigned numbers within each block, thus allowing for expansion. For example, the maternal and child health program was assigned the 400 series numbers with three major divisions, 410, 420, and 430. However, the 410 series extends only through 414 at this time. Insofar as possible, the hundreds position of the code identifies a broad disease group or program; the tens position identifies a subgroup within the broad grouping, and the units position identifies specific diagnostic categories or components of the program.

Other desired information included: (1) identification of the nurse performing the service; (2) the geographic area in which the service was given; (3) the month, day and year on which the service was given; (4) the age, sex, and race of the patient; and (5) the revisit date which the nurse assigned to the case. The planning group decided that it would also be valuable to ascertain the data for multiple services rendered to one person. For example, in the past when a patient who had been carried for the tuberculosis nursing supervision became pregnant, tuberculosis supervision was usually considered the priority service, and the patient was lost in the count for antepartal services. Some members of the group felt that three or four services might be rendered to one individual. However, an analysis of 200 family records indicated that in only two or three instances were there more than two distinct major services given to an individual.

As the development of the classification list or code proceeded, the administrative members of the group began to consider the specific type of mechanical record system which would be most useful and economical for an agency of this size. Limitations of space and the necessity for technical personnel to operate equipment seemed to preclude the use of the "mark sense" card for an IBM system or other machine processing systems at that time. It was also believed that too many problems were inherent in the use of a central processing unit for the tabulation of local data. Major limitations were believed to be transportation of record material and,

most important, delay in the receipt of service statistics from the central operating unit. Therefore, attention was given to the use of a marginal punch card. While the volume of punch cards to be sorted for the work performed by 51 nurses seemed to be large, it was deemed not impossible nor impractical. The cost of such a system seemed to be within the realm of possibility for this department, and the opportunity to use nontechnical personnel in processing offered a real advantage.

In January, 1955, the position of administrative analyst and director of records and statistics was created. Consultant service from the University of Michigan School of Public Health was retained.

The first marginal punch card to which the classification code was applied was a 6 x 9 inch card. This card included the nurse's call slip or request for service. The following defects became apparent during the first field trial: The size of the 6 x 9 card was awkward and required special files. The cards were bulky and did not fit into the nurses' bags. Too, the space allowed for request of service was inadequate and since so many requests originated in the field through the case-finding program it seemed that to include this item on the card was not a major asset.

A 5 x 8 marginal punch card was the next step in the development of the record system. A second field trial was held, using the 5 x 8 card. Two new people were added to the participating group, one a person for whom records were a trial and the other for whom records were fairly easy. This was done so as to ascertain the specificity and clarity of the instructions and definitions which had been developed. As soon as the second field trial was completed, meetings were held with the entire nursing staff to interpret to them the instructions and definitions and to allow for a practice period of punching. It is the normal procedure in this division to have regular supervisors' meetings at which time policies are discussed and determined. These are in turn interpreted by the supervisor to her group of nurses. This plan was discarded in this instance because it was believed imperative that all people receive exactly the same instructions and answers to questions at the same time, thus eliminating, insofar as possible, differences in interpretation. A staff meeting was held each week during the month of November, 1955. During this month all nurses kept the new record system and continued to maintain the old one. This permitted sufficient practice and allowed time to iron out any of the problems which had not been anticipated. Whereas it had been the opinion of the nursing director that one of the most difficult things to have the staff accept would be the actual punching, and that the staff would have the most difficulty in performing this, this did not prove to be the case. The area in which there was the most confusion and in which the staff struggled hardest to arrive at a common ground was in area of definitions. The problem lay in making definitions specific and mutually exclusive.

An examination of the marginal punch card will reveal a code field for the nurse's number in the upper right hand corner of the card. One group of numbers is assigned to administrative and consultant staff, one to supervisory staff, one to field staff and one to students. Proceeding toward the left across the top, the next code field is for the geographic code. There is an unidentified single code position in the center of the card and a code field for the month, day and year. Proceeding down the left side of the card are code positions for hours, mileage, and students. Across the bottom are code fields for status of the case, patient classification, primary program code, revisit date, and "H" position. Going around the

card on the right hand side there are direct code positions for referral and a code field for secondary program. There are five unidentified code positions left. This proves to be valuable when special studies are being done, for any predetermined value can be assigned to these code positions.

Throughout the development of the classification or code, and its application to the marginal punch card, specific illustrations of services were used to insure that adequate provision had been made for coding. This process also demonstrated the necessity for adequate instructions and, above all, specific definitions.

The "H" position was originally designated to provide for differentiation between number of home visits and number of homes visited. For example, on a home visit made to a tuberculosis case and five contacts six cards would be punched indicating a home visit in each; however, only one home was entered. The "H" Position is now used also to indicate: (1) one clinic, (2) one school visited, and (3) one meeting.

In a clinic situation, each nurse makes a card recording a clinic activity. Only the nurse in charge punches the "H" position on the card which she has completed. She also punches the direct code position for hours and students, entering the number of hours the clinic was in session and the number of patients seen. Thus, we know the number of nurses participating, the number of hours spent in clinic activities, the number of clinics held, and the number of patients seen.

The three direct code positions in the lower left side of the card for hours, mileage, and students have been mentioned. A perforation in one of these positions indicates that there is a sum written in this space. These cards are sorted and sums or figures are manually tabulated. The direct code position, "students," was originally used to designate the number of students seen in a given school for minor services. The name, grade, and purpose of visit was listed for several students, eliminating the necessity of an individual card for each student. This code position is now used also to indicate the number of patients seen in one clinic or other multiple services of a similar nature.

There were certain other programs or activities for which the nursing administrator believed that it was desirable to know the exact amount of time spent. These were: office-type activities, visits to schools, home visits to school-age children, meetings and conferences, clinic time, and time spent in the student program.

The following are some examples of the coding of typical services performed by the public health nurse:

Example I—Activity 01, indicating a home visit.
Status of the case 1—1, indicating that it is an admitting visit to a patient with an acute condition.
Patient classification 40, indicating that it is a school-age child.
Program code 043, indicating that the program is communicable disease control and that the patient has been diagnosed as a rheumatic fever case.

Example II—Activity 07, indicating a visit to a public school.
Status of the case 7—7, not applicable.
Patient classification 40, school.
Program code 814, indicating school health program, student interviews or inspections.
Punch-in "hours," writing in length of visit.
Punch-in "students," writing in number of students to whom services were given.

Example III—Activity 04, indicating a clinic.
Status of case, 7—7, not applicable.
Patient classification 50, adult.
Program code 956, clinic program, venereal disease clinic.
Punch-in "hours" and amount of time recorded.
Punch-in "ST" and number of patients recorded.

Example IV—If a field supervisor were supervising one of the foregoing activities she would code:
Activity 12, supervision and evaluation.

Status of case 7—7, not applicable.
Patient classification 80, not applicable.
Program code 915, supervision and staff education program, supervision of field activity.

In order to prevent duplication and to facilitate processing, it was decided that the marginal punch card would be made up in two ways:

1. A single manila punch card which would be used for statistical purposes and for recording of required information on single visit services or services for which no permanent record is necessary (see Figure 1).
2. A triplicate form, which is the manila marginal punch card with two overlays. These are supplied in pads of 25 each (see Figure 2).

The triplicate form is used for services to families on whom there is a family record or services of which a record is maintained by the nursing division. The original overlay is placed in the family folder, the second overlay is used for a revisit card in the clerical office and the manila card goes to the statistical office for processing. At the time for revisit, the record is automatically pulled by the clerical staff and placed in the nurse's box. The overlay has also proved to be very helpful in the school health program. For example, the nurse keeps the original overlay for her own record, the duplicate is given to the principal or school administrator, and the manila punch card is returned to the office for the statistical report. The triplicate is also used as a daily time sheet. This is completed only with the nurse's number—the day, month, and year punched and the single unidentified code position at the top of the middle of the card. Hours and mileage are also punched and recorded. The original copy of the overlay goes to the administrative office for payroll purposes; the nurse keeps the duplicate for her own record and the marginal punch card is sent to the statistical department.

During 1956, the first full year in which the record system was maintained, certain needed changes in the code became apparent. For example, it was

Figure 1—Single Manila Punch Card

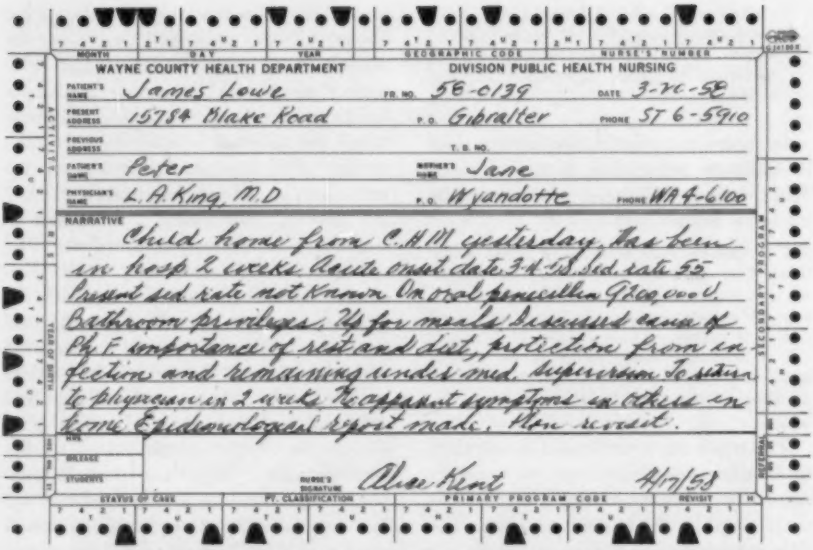

MONTH
DAY
YEAR
GEOGRAPHIC CODE
NURSE'S NUMBER
WAYNE COUNTY HEALTH DEPARTMENT
DIVISION PUBLIC HEALTH NURSING
PATIENT'S NAME James Lowe
FD. NO. 56-0139
DATE 3-20-58
PRESENT ADDRESS 15784 Blake Road
P.O. Gibralter
PHONE ST 6-5910
PREVIOUS ADDRESS
T. B. NO.
FATHER'S NAME Peter
MOTHER'S NAME Jane
PHYSICIAN'S NAME L. A. King, M.D
P.O. Wyandotte
PHONE WA 4-6100
NARRATIVE
Child home from C.H.M yesterday. Has been in hosp 2 weeks. Acute onset date 3-4-58. Sed. rate 55. Pneumococcal sed rate not known. On oral penicillin 600,000 U. Bathroom privileges. Up for meals. Discussed cause of Rh F importance of rest and diet, protection from infection and remaining under med. supervision. To return to physician in 2 weeks. Re apparent symptoms or illness in home. Epidemiological report made. Mom recruit.
NURSE'S SIGNATURE Alice Kent
4/7/58
STATUS OF CASE
PT. CLASSIFICATION
PRIMARY PROGRAM CODE
REVISIT

Figure 2—Triplicate Form (Manila Marginal Punch Card with Two Overlays)

found that the communicable disease code and the disease condition code were too detailed. The mental health code was also too detailed but was not specific enough to allow for easy coding. It was broken down into mental illness (general), symptom problems, disturbed child, behavior problems, delinquency, family relationship disorders, and problems of adjustment, with subitems under each of these major headings. An evaluation was made by the entire nursing staff in November, 1956, and recommendations were made. These were discussed with the administrative analyst who concurred that the changes would be beneficial and would lead to more accurate reporting. In the original code "activity and program" were sometimes confused. Every effort has been made to eliminate this in the revised code.

Evaluation of Record System

There was an initial cost of $6.20 for one punch per nurse. On the last order the cost of McBee Keysort cards was: single, $6.03 per thousand, triplicate, $18.09 per thousand. The division has used approximately 150,000 single cards and 105,000 triplicate cards per year. This amount has allowed for about a three- or four-month oversupply to provide a safety period during which supplies were reordered and delivery was awaited.

The maintenance of this record system has taken approximately 50 per cent of the time of the administrative analyst and approximately the time of one and one-half clerks. During the time cost study, which was done by the nursing division during 1957, a separate cost center was added for punching, this being the only additional factor involving nursing time for the use of this system, since the nurse would have to write a record anyway in connection with the visit. Time spent on recording of family, clinic, or school services is allocated to the service performed. Punching time averaged 15 minutes per

nurse per day. This is indeed small in comparison to the amount of time saved, in that the nurses do not have to write multiple records and records are automatically pulled at the time of revisit. Since the records are completed and back in file more quickly, time needed to search for records has been sharply reduced.

Does this system provide desired and required information to improve services? We believe that it does. For the first time individual staff nurses and field supervisors have information from the area reports as to services given by program in each geographic area. This assists the staff nurse and supervisor in evaluating whether established priorities are being maintained and whether the services performed in a given area seem to be meeting the needs of the particular community.

The nursing administrator has much more accurate information as to the specific activities and services being performed by nursing personnel. For example, for the first time she knows not only the total amount of time spent in office-type activities but the amount of time spent in specific types of activities, by types of personnel. Armed with such information she is able to justify the amount of office time used or is able to recommend the reduction in specific areas which seem to be less important. During April 1957, 23.2 per cent of all nursing time was spent in office-type activities. Can this be justified? Supervisory and administrative personnel spent 68.1 per cent of their total duty hours on office-type activities. This indicates that not all supervision is being done at the supervisor's desk. Approximately 32 per cent of her time is being spent in the field supervising field and clinic activities. We believe that this is good. Staff nurses spent 11.5 per cent of their total hours on duty in office-type activities. We believe that this amount of time cannot be reduced appreciably. Students spent 15.7 per cent of their total hours on duty in office-type activities. These nurses have conferences with field teachers and supervisors. They need time to become acquainted with policies, office reference manuals, and the record system. Certainly this specific information is much more meaningful than the gross figure of 23.2 per cent spent by the entire staff. Such specific information has enabled the administrative and supervisory staff to make recommendations which have resulted in the reduction of time spent in office-type activities. It is not known exactly where the reduction took place, by activity or by type of personnel, because previous data were too gross. It is known, however, that there has been a reduction in the gross figures.

The specific information regarding services by program and geographic area assists the nursing director in interpreting the service requirements to other division directors within the department, which in turn assists in the establishment of priorities of service. The information has proved to be extremely helpful in program planning. For example, this past year the health department was requested to conduct a tuberculin testing program in one large area in the central portion of the county. This was tentatively agreed to; however, when the nursing director pointed out to the medical director the distribution of nursing time, it became apparent that some services would have to be dropped if the new program was to be conducted. Based on past experience, we were able to estimate the number of clinic hours which would be required and the approximate number of home visits which would be needed for follow-up purposes. From information received from the time cost study we were able to assign dollars and cents values to these amounts of time. After more careful study in relation to the services which would have to be dropped and the cost of the pro-

gram in time and money, it was decided that the staff would be unable to take on the project without a budget appropriation for additional personnel. This is one of the few instances in this nursing administrator's experience where a value judgment was made based on facts and figures and not on seeming desirability of the program or on pressures from interested groups.

As the first monthly reports were received, we were surprised to learn the rather high percentage of home visits which were unproductive because the family was not at home. The nursing administrator requested an analysis of "not at home" visits by type of program. The greatest number were made in connection with the maternal and child health program. A special committee was appointed to study the problem.

As a result of available specific data, shifts have been made in program so that the visits to school-age children have been reduced and the visits to antepartal and postpartal patients, infants under one year, and preschool children have been increased. Information gathered from the distribution of visits by patient classification by major control program has pointed out some important facts. It was assumed that the vast majority of visits to patients with malignant neoplasms were to the adult age group. This, however, is not true. In some instances, up to 40 per cent of the visits were made to preschool-age children.

Other advantages of the record system are: (1) It provides a means of brief, pertinent narrative reporting; (2) the recording is done just as soon as possible following the activity; (3) records are in on time; (4) multiple uses have been devised; (5) necessary information is obtained for program and performance budgeting; (6) the staff is informed as to specific services which are being performed, by program and by geographic area.

Some disadvantages of the record system are: (1) Accumulation of overlays in some family folders where several different members are being carried for different services. This tends to make the record bulky; (2) the supervisor does not have a day by day work sheet from each nurse indicating duties in the order in which they are performed; and (3) identifying information has to be rewritten, since a new card is made each time the patient is seen.

Possible solutions to the disadvantages are: (1) Since the number of family folders in which the record becomes extremely bulky is very small in number, a periodic summary of these cases can be made and the original overlays destroyed. This plan is being instituted. (2) The nurse can record her daily activities in chronological order on the overlay of the record which she is going to use as her daily time sheet. The original can go to the supervisor, the duplicate to the time office, and the manila card to the statistical division. In this way the staff nurse and her supervisor will have the information necessary for better district management and travel routes. This plan is being adopted. (3) All identifying information does not have to be recorded for each visit. The name of the patient and the family record number is sufficient.

It goes without saying that the best record system in the world will not improve services if the information is not analyzed and necessary program shifts are not made. The services of a person trained in the gathering of statistics and in their interpretation are of course extremely desirable. It is equally important, however, that the nursing administrator interpret the statistics which are given to her in light of the changes which she knows have occurred, either in staffing or in change of priorities necessitated by special programs or emergencies. It should also

be pointed out that a time cost study is a necessary adjunct of any record system if cost per unit of service is to be determined and applied to the number of services given in any specific program. It is the application of the data obtained from the time cost study to the specific units of service which leads to a program and performance budget.

Analysis of the Statistical Methods Used

For the purpose of this paper we shall define analysis, using Webster's definition: "The separation of anything into consistent parts or elements; an examination of anything to distinguish its component parts separately or in relationship to the whole."

We shall define statistics as: "Body of methods of obtaining and analyzing data in order to base decisions on them." [1]

In an analysis of data we look to see how the information derived and/or the methods used meet certain standard requirements. We shall attempt to set forth how this method meets or fails to meet some such standards as: (a) the basic principles governing services statistics in public health,[2] (b) the needs for information used in program budgeting, and (c) the needs for information used in performance programming.

In relationship to the (a) the basic principles governing service statics, we find that this system: (1) provides data required for the public and other agencies; (2) helps us measure the extent of programs; (3) is significant for the purposes served; (4) is readily available; (5) helps measure progress in relation to problems; (6) is used; (7) can be tied to demographic base line data; (8) places emphasis on class of patient seen and the program under which the service was rendered; (9) develops statistics as a by-product of administrative operation of a program; (10) gives an unduplicated count of individuals receiving services; and (11) contains pertinent items relating to programs without disturbing other records.

Thus the system fulfills at least eight requirements of the basic 10 principles. The method does give information for determining the extent to which program needs are or are not being met and, when combined with other available information, shows whether or not assigned program priorities are being adhered to. It does give quantitative information which, when analyzed, can to some degree give qualitative information as to performance.

Tabulation of Data

The program cards are sorted daily, by major activity code, as they come into the statistical office. At the end of each month these cards are then sorted as to geographic areas and each area is then broken down into patient classification, status of the case, and major program codes.

When these sorts are all completed, tabulation of the data is started for the following tables: (1) home visits, by area, by status of the case, by patient classification; (2) home visits, by county overall, by status of the case, and patient classfication; (3) school visits, by areas, by type of school, by program code; (4) school visits, by county overall, by type of school, by program code; (5) clinic activities, by type and hours of time; (6) office time, by type of activity, by number of activities and hours of time; (7) field-type activities other than school and home visits, by area; (8) care center evaluation; (9) training, educational, and professional-type activities, by type of activities, number of activities, and hours of time.

When these data are completely processed, a report known as the "local

health activities report" is prepared for the state health department.

Analysis of the Data

After all tabulations are completed, analysis of the data is started. The start of the analysis is the formation of 16 basic tables.*

The first four of these tables deal with the hours of nursing time on duty. Table 1 sets forth the total hours on duty distributed as to type of duty, whether it is office, school, clinic, or field. Tables 2 and 3 show the distribution of hours of time on duty by personnel classification with a breakdown of total time into office time and other. Here we show the relationship of hours spent with regard to the current month's time, the preceding month, and year to date. In that the number of nurses on duty fluctuate from month to month, hours of time are compared percentage-wise rather than by exact hours of time. Table 4 is prepared to show how office hours of time are utilized in certain types of activities. Here again we rely on percentage figures to show variances rather than on actual hours of time.

Tables 5 through 10 are used for the analysis of the home visiting program. An attempt to show variances in time spent, by patient classification and by major control programs, is embodied in Tables 5 and 6. Here again we relate the activities for the current month, the preceding month, and the year to date figures to indicate variances. The formula for determining the standard error of the differences for proportions is used to determine amounts of variance in the existing data.

Tables 7 through 10 are used to show the current month's activities, by program and patient classification relationship and by area by patient classification relationships. The relationships, by program, by status of the case and patient classification, are presented in the individual area reports.

Tables 11 through 13 are prepared to show relationships in activity emphasis in the school program. Here we also include the number of home visits to school-age children by the hours of time required for these services so that we have a more complete picture of the school program.

To show the use of the material from the cards for program and performance budgeting, an example will be presented: During the first seven months of 1957, information passing through the Division of Analysis and Statistics office indicated there were 1,861 firstborns, immature, premature, and congenital malformed infants born in the Wayne out-county area during this period. Card data showed 1,422 admit visits made on these infants. This left an unmet need of 440 visits for this period. Our average home visit to a newborn approximates 50 minutes in length. These 440 visits represent the equivalent of 366 hours of needed nursing time. This is the equivalent of 52 hours of needed nursing time a week, or, at 35 hours per workweek, the equivalent of 1.5 additional nurses a week if we are to cover this entire need.

Special Studies

When time is available and/or if a need is expressed for more information relating to specific activities, special studies are completed.

Conclusion

In criticism we may say of this particular system: (1) that it is not as rapid as mechanical machine operations; (2) that it is easier for errors to creep in due to manual tabulations; (3) that it is not as flexible in breakdown of data operations as are machine methods; and

* Not reproduced herein.

(4) that it becomes cumbersome in large departments.

One might ask, "Is the lemon worth the squeeze?" We feel that it is, for the following reasons: (1) For the first time the public health nursing division is obtaining information by which it can do program budgeting and performance reporting; (2) standards of the eight basic principles of service statistics are met; (3) economy of office space is effected; (4) no installation of expensive machines is required; (5) information for immediate use and for special studies in the present or future is provided; (6) a minimum staff is required; and (7) sampling technics are easily applied.

REFERENCES

1. Wallis, W. Allen, and Roberts, Harry V. Statistics, a New Approach. Glencoe, Ill.: Free Press, 1956, pp. 5-6.
2. Basic Principles Governing Service Statistics in Public Health. Report of the Working Group on Service Programs, Public Health Conference on Records and Statistics. Pub. Health Rep. (June), 1956.
3. Sack, Ralph B., and Swayne, James B. Application of Work Measurements and Performance Budgeting to Local Health Services. (Unpublished, pp. 2, 4, but obtainable from Los Angeles City Health Department, Los Angeles 12, Calif.)
4. Faubenhaus, Leon J.; Hamelin, Robert H.; and Wood, Robert C. Performance Reporting and Program Budgeting: Tools for Program Evaluation. A.J.P.H. 47:432-437 (Apr.), 1957.

Miss Krause is director of the Division of Public Health Nursing at the Wayne County Health Department, Eloise, Mich., and Mr. Vaughn is administrative analyst of the department.

This paper was presented before a Joint Session of the Health Officers and Statistics Sections of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 12, 1957.

Pediatric Fellowships Supported by Wyeth Laboratories

The American Academy of Pediatrics and the Wyeth Laboratories announce the availability of 20 two-year fellowships providing for postgraduate pediatric studies. Candidates for fellowships may include research fellows, interns, and physicians who have completed internship, military service, or a Public Health Service tour. Those receiving grants may attend any hospital whose residency program is properly accredited by the Residency Review Committee of the American Academy of Pediatrics.

Wyeth Laboratories is supporting the program at a cost of more than $50,000 annually. Each grant carries an annual stipend of $2,400. Chairman of the Fellowship Selection Committee is Philip S. Barba, past president, American Academy of Pediatrics. Other members are John A. Anderson, M.D., chairman, Department of Pediatrics, University of Minnesota School of Medicine; Amos Christie, M.D., with a similar position in Vanderbilt University; and two pediatricians in private practice, Hugh A. Carithers, M.D., Jacksonville, Fla., and Crawford Bost, M.D., San Francisco, Calif.

For grants effective July 1, 1959, applications must be submitted to a committee member by November 28, 1958. Further information and application forms from Dr. Philip S. Barba, University of Pennsylvania School of Medicine, Philadelphia.

How good are studies based on mortality statistics? This investigation was undertaken to determine the quality of diagnostic evidence supporting the accuracy of cause-of-death statements.

INQUIRY INTO DIAGNOSTIC EVIDENCE SUPPORTING MEDICAL CERTIFICATIONS OF DEATH

Iwao M. Moriyama, Ph.D., F.A.P.H.A.; William S. Baum, M.D.; William M. Haenszel, F.A.P.H.A.; and Berwyn F. Mattison, M.D., F.A.P.H.A.

STATISTICS ON causes of death have been used extensively in the epidemiological study of diseases. Because of the systematic coverage of deaths in the total population, mortality statistics have provided useful information for epidemiological studies. However, the value of such studies has been questioned from the standpoint of inaccuracies in the statements of causes of death. The studies on the accuracy of cause-of-death statements have taken clinical or pathological reports as the point of departure for comparison with the medical returns on the death certificate.* [1-3]

It is difficult to generalize from the results of these studies in the interpretation of general mortality statistics. By necessity, these studies have been limited to deaths on which hospital records or autopsy reports were available. Since less than half of all deaths occur in hospitals and only about 15 per cent of all deaths go to autopsy, studies based on such data may be subject to considerable bias. Hospital deaths tend to be weighted with surgical cases, acute illnesses, and illnesses more difficult to diagnose. Pathological findings are sought more for deaths where the clinical diagnosis is not clear, or where diagnostic confirmation is desired. Thus, the selection of hospital deaths, and more particularly deaths where autopsies are performed, should lead to greater disagreement than would appear in a hypothetical situation where cause-of-death statements for all deaths are compared with clinical or pathological findings. Since, in practice, clinical and pathological reports are not available for all deaths, one alternative is to start with the death certificate and query the physician. In this manner, his knowledge and subjective impressions can be utilized for the interpretation of cause-of-death statements.

Material and Methods

To explore the use of death certificates in delineating possible relations of smoking, residence, and work histories to cancer of the lung,[5] a sample of 1,837 deaths occurring in Pennsylvania during the three months of 1956 was studied. As part of this pilot study, additional information was collected from certifying physicians to determine the possibilities of developing measures of quality of medical certifications and to ascertain the problems involved in the conduct of such a study. These investigations were conducted in cooperation with

* One exception to this approach is the study by Nicoll and Bellows,[4] who took a sample of death certificates and queried the certifying physician about the presence of syphilis, tuberculosis, alcoholism.

the Pennsylvania State Department of Health.

The death certificates selected for this purpose came from the 10 per cent Current Mortality Sample (CMS) sent to the National Office of Vital Statistics, a representative sample of all deaths in the state. The causes covered in this investigation included tuberculosis, malignant neoplasms, diabetes, all cardiovascular-renal diseases, influenza and pneumonia, and cirrhosis of the liver. Such causes as accidents, suicides, and homicides were excluded, and the CMS sample augmented by inclusion of all deaths from cancer of the respiratory system occurring during the three-month period. For cardiovascular-renal causes, not all certificates in the CMS sample were queried; depending on age and race, one-fourth to one-half of the certificates of death for those over age 40 were selected for study. The tabular results for the total sample and certain subgroups of causes have been adjusted to take account of the differential rate of sampling. The adjusted totals represent one-tenth of the deaths from the causes selected for study in Pennsylvania in the three-month period.

Questionnaires were sent to physicians signing the death certificates asking for information on the following points: (a) diagnostic methods, with pertinent findings, on which the medical certification of death was based; (b) an expression of his certainty of the diagnosis entered on the medical certification; (c) a revised medical certification if his opinion on diagnosis had changed since signing the death certificate. When the certifier indicated that his source of information was another physician who had previously attended the patient, a query was sent to that person as well. Follow-up letters were sent as indicated. Completed returns were received from physicians for 96 per cent of the deaths queried. Deaths certified by coroners and medical examiners were followed in the manner described above, except that expressions of certainty of diagnosis were not requested.

The returns were reviewed along with the original cause-of-death statement under the direction of an internist (WSB) and rated on the following points: (a) quality (type and amount) of supporting diagnostic information; (b) consistency of medical certification with the diagnostic evidence; and (c) the physician's opinion of certitude of diagnosis. The reviewing internist also entered his impression of certainty of the diagnosis. The latter rating was not independent of that stated by the certifier. In many instances, the physician's opinion was taken into account with the other diagnostic evidence in assigning a rating. The ratings were later checked by listing individual deaths in cause order with respect to specific diagnostic methods, quality of supporting diagnostic information, consistency of medical certification and certitude of diagnosis. The combined information was then reviewed and checked for internal consistency.

Results

Medicolegal Certifications—Table 1 shows, by cause, the number and proportion of medicolegal certifications. Except for cardiovascular-renal diseases, the number of deaths certified by the medical examiner and coroners for the causes studied was insignificant. The problems of medicolegal certifications cannot be regarded as an important contributing source of error in mortality tabulations for nonviolent deaths other than those from cardiovascular-renal diseases.

Over 90 per cent of the deaths from natural causes certified by the medical examiner and coroners in the three-month period were ascribed to diseases of the cardiovascular-renal system. The number of deaths signed out by the

Table 1—Death Certificates with Cause of Death Certified by Coroner or Medical Examiner: Pennsylvania Sample, Three-Month Period, 1956

(Numbers after causes of death are those of the Sixth Revision of the International Lists, 1948)

Cause of Death	Total Death Certificates	Cause of Death Certified by Coroner or Medical Examiner	
		Number	Per cent of Total
Total Weighted Sample *	2,122	232	10.9
Tuberculosis, all forms 001–019	27	2	7.4
Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues * 140–205	443	10	2.3
Diabetes mellitus 260	61	1	1.6
Major cardiovascular-renal diseases * 330–334, 400–456, 590–593	1,406	212	15.1
Vascular lesions affecting central nervous system * 330–334	254	18	7.1
Rheumatic fever and rheumatic heart disease * 400–402, 410–416	41	3	7.3
Arteriosclerotic heart disease so described 420.0	297	37	12.5
Heart disease specified as involving coronary arteries * 420.1	395	124	31.4
Other heart disease except hypertension * 421, 422, 430–434	167	7	4.2
Hypertensive diseases * 440–447	150	22	14.7
Other cardiovascular and renal diseases * 450–456, 590–593	102	1	1.0
Influenza and pneumonia, except pneumonia of newborn 480–493	31	1	3.2
All other ..... Residual	154	6	3.9

* Figures adjusted to represent one-tenth of the deaths for the three-month period, that is, the number of deaths in the Current Mortality Sample.

medical examiner and coroners as cardiovascular-renal diseases represented 15 per cent of the total recorded for this cause in Pennsylvania. A surprising feature is that medicolegal certifications account for only 7 per cent of deaths from vascular lesions of the central nervous system, since this cause often results in sudden death. Another cause frequently linked with sudden death, coronary heart disease, does exhibit a high proportion of medicolegal certifications, 31 per cent. The latter figure is consistent with experience recorded elsewhere. This apparent anomaly arises because persons who suffer cerebrovascular accidents often have symptoms placing them under more or less continuous medical supervision. Coronary disease, on the other hand, may occur among persons with no recent history of medical attention. These data clearly indicate that the care with which the medical examiner and coroner discharge their legal responsibilities can significantly affect the statistics for coronary and hypertensive heart diseases.

Quality of Diagnostic Information—The criteria used for rating the quality of diagnostic information differed for specific diseases and are summarized in Table 2. The results of these ratings

Table 2—Classification of Quality of Supporting Diagnostic Information

Cause of Death (Int. List Nos.)	Very Good	Good	Sketchy
Tuberculosis (001–019)	Autopsy or operation and biopsy or x-ray with positive sputum or culture	X-ray with increasing area of destruction	Clinical impression; suggestive x-ray findings
Malignant neoplasms (140–205)	Autopsy or operation or endoscopy with microscopic confirmation*	Positive cytology alone or in combination with other nonmicroscopic findings or operation or definite x-ray findings, without microscopic confirmation or biopsy of a metastatic site or laboratory findings for specific sites	Clinical impression; suggestive x-ray findings
Diabetes mellitus (260)	Diabetic complications or typical clinical findings supported by laboratory evidence	Strongly suggestive clinical and laboratory findings	No detailed support of clinical diagnosis other than reference to urinalysis
Vascular lesions affecting central nervous system (330–334)	Autopsy or typical clincal findings or good clinical history supported by lumbar puncture or history of previous attacks	Strongly suggestive clinical findings not supported by lumbar puncture or history of previous attack	No detailed support of clinical diagnosis
Rheumatic heart disease (410–416)	Autopsy or combination of at least two of the following items; history of rheumatic fever, clinical picture (heart murmur), definite EKG findings	Typical history of rheumatic fever or strongly suggestive clinical or EKG findings	No detailed support of clinical diagnosis
Other forms of heart disease (420–447)	Autopsy or clinical findings supported by definite EKG findings or for hypertensive disease by definite x-ray findings	Typical clinical signs alone or combination of suggestive clinical and EKG or x-ray findings	No detailed support of clinical diagnosis
Influenza and pneumonia (480–493)	Autopsy †	Clinical findings supported by x-ray or culture findings	No detailed support of clinical diagnosis

* Removal of an organ was interpreted as implying microscopic confirmation.

† While for lobar pneumonia a combination of positive clinical and culture findings would have been classified as "very good," no such cases were encountered in the sample studied.

by cause of death are presented in Table 3. Since the major concern is with the interpretation of general mortality data, all analyses are presented in terms of the underlying cause as stated on the original death certificate.

Table 3—Deaths from Specified Causes by Quality (Type and Amount) of Supporting Diagnostic Information: Pennsylvania Sample, Three-Month Period, 1956

(Numbers after causes of death are category numbers of the Sixth Revision of the International Lists, 1948)

Cause of Death	Total Death Certificates	Per cent Distribution				
		Total	Very Good	Good	Sketchy	No Report
Total Weighted Sample *	2,122	100.0	39.1	18.5	38.5	3.9
Tuberculosis, all forms 001-019	27	100.0	74.1	0	14.8	11.1
Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues * 140-205	443	100.0	68.4	12.9	15.3	3.4
Malignant neoplasm of digestive organs and peritoneum 150-159	191	100.0	65.4	12.0	18.3	4.3
Of stomach 151	49	100.0	51.0	20.4	24.5	4.1
Of large intestine including rectum 153, 154	97	100.0	72.2	9.3	13.4	5.2
Of pancreas 157	16	100.0	56.3	12.5	31.3	0
Malignant neoplasm of respiratory system * 160-165	59	100.0	62.7	10.6	15.3	3.4
Of trachea, and of bronchus and lung specified as primary 162	21	100.0	66.7	19.0	9.5	4.8
Of lung and bronchus, unspecified as to whether primary or secondary 163	33	100.0	57.6	21.2	18.2	3.0
Malignant neoplasm of breast 170	32	100.0	68.8	15.6	12.5	3.1
Malignant neoplasm of uterus 171-174	28	100.0	85.7	0	14.3	0
Malignant neoplasm of male genital organs 177-179	21	100.0	61.9	14.3	19.0	4.8
Malignant neoplasm of urinary organs 180, 181	16	100.0	87.5	6.3	6.3	0
Malignant neoplasm of lymphatic and hematopoietic tissues 200-205	28	100.0	89.3	10.7	0	0
Diabetes mellitus 260	61	100.0	42.6	24.6	31.1	1.7
Major cardiovascular-renal diseases * 330-334, 400-456, 590-593	1,406	100.0	28.7	19.8	47.4	4.1
Vascular lesions affecting central nervous system * 330-334	254	100.0	20.9	23.2	51.2	4.7
Rheumatic fever and rheumatic heart disease * 400-402, 410-416	41	100.0	58.5	19.5	14.6	7.4
Arteriosclerotic heart disease, including coronary disease 420.0, 420.1	692	100.0	29.8	17.6	49.0	3.6
Other heart disease except hypertension * 421, 422, 430-434	167	100.0	17.4	16.2	64.1	2.3
Hypertensive diseases * 440-447	150	100.0	30.7	27.3	36.0	6.0
Influenza and pneumonia, except pneumonia of newborn 480-493	31	100.0	16.1	25.8	51.6	6.5

* Figures adjusted to represent one-tenth of the deaths for the three-month period, that is, the number of deaths in the Current Mortality Sample.

The kind and amount of diagnostic information reported as being available to the medical certifier varied considerably. In 4 per cent of the deaths, no information was volunteered at all. In 38 per cent, the diagnostic data given were sketchy. In the remainder, 58 per cent, the information was considered very good (39 per cent) or good (19 per cent). In interpreting these results, it should be pointed out that the proportion of "very good" and "good" ratings are minimum figures since the physician may have had more information at his disposal which was not communicated on the query form. Also, the computed percentages do not exclude deaths for which no information was reported.

The picture for total deaths does not differ greatly from that for physicians' certifications alone. This is not surprising since physicians' certifications account for the bulk of total deaths, 91 per cent. It may be more surprising that for the important cardiovascular-renal disease category the proportion of "very good" medicolegal certifications, 20 per cent, approached that for physicians' certifications, 30 per cent. The apparent reason, in Pennsylvania at least,

is that the coroner or medical examiner often consults the attending physician, if there is one, before making out the death certificate; or if the reasons for death seem unclear, he orders an autopsy performed.

The quality of reported information on diagnostic methods varies by cause. It was better for malignant neoplasms than for other diseases. In 68 per cent of the deaths attributed to cancer, the diagnostic information was "very good," meaning that it was based on microscopic examination of tissues. This result is consistent with evidence provided by cancer morbidity surveys in 10 metropolitan areas [6] and in Iowa.[7] While the numbers studied are not large enough to yield more than suggestive results, the diagnostic evidence for malignant neoplasms appears weakest for stomach and pancreas, a finding in agreement with prevailing clinical opinion. The diagnoses of malignant neoplasms of the lymphatic and hematopoietic tissues were particularly well supported, being rated

Table 4—Consistency of Medical Certification with Diagnostic Evidence by Cause of Death: Pennsylvania Sample, Three-Month Period, 1956

(For category numbers of causes of death see Table 3)

Cause of Death	Total Death Certificates	Per cent Distribution				
		Total	Most Probable Diagnosis	Another Diagnosis Equally Probable	Another Diagnosis Preferred	No Diagnostic Information
Total Weighted Sample *	2,122	100.0	78.7	12.7	4.7	4.9
Tuberculosis, all forms	27	100.0	85.2	0	3.7	11.1
Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues *	443	100.0	85.8	5.0	5.6	3.6
Malignant neoplasm of digestive organs and peritoneum	191	100.0	82.2	7.9	5.8	4.1
Of stomach and large intestine except rectum	120	100.0	83.3	5.0	6.7	5.0
Of rectum	26	100.0	88.5	3.8	3.8	3.9
Of biliary passages and of liver (stated to be primary site	13	100.0	92.3	0	0	7.7
Of pancreas	16	100.0	68.8	31.3	0	0
Malignant neoplasm of respiratory system *	59	100.0	88.1	5.1	1.7	5.1
Of larynx	4	100.0	100.0	0	0	0
Of trachea and of bronchus and lung specified as primary	21	100.0	90.5	4.8	0	4.7
Of lung and bronchus, unspecified as to whether primary or secondary	33	100.0	84.8	6.1	3.0	6.1
Malignant neoplasm of breast and female genital organs	68	100.0	94.1	1.5	1.5	2.9
Of breast	32	100.0	93.8	0	3.1	3.1
Of uterus	28	100.0	96.4	3.6	0	0
Malignant neoplasm of male genital organs	21	100.0	90.5	4.8	0	4.7
Malignant neoplasm of urinary organs	16	100.0	100.0	0	0	0
Malignant neoplasm of lymphatic and hematopoietic tissues	28	100.0	100.0	0	0	0
Leukemia and aleukemia	13	100.0	100.0	0	0	0
Lymphomas and myelomas	15	100.0	100.0	0	0	0
Diabetes mellitus	61	100.0	86.9	8.2	3.3	1.6
Major cardiovascular-renal diseases *	1,406	100.0	78.2	14.4	3.3	4.1
Vascular lesions affecting central nervous system *	254	100.0	85.0	8.7	1.6	4.7
Rheumatic fever and rheumatic heart disease *	41	100.0	82.9	9.8	0	7.3
Arteriosclerotic heart disease so described and heart disease specified as involving coronary arteries *	692	100.0	78.6	16.5	1.3	3.6
Other heart disease except hypertension *	167	100.0	66.5	19.8	11.4	2.3
Hypertensive diseases *	150	100.0	76.0	16.0	2.0	6.0
Other cardiovascular-renal diseases *	102	100.0	78.4	5.9	11.8	3.9
Influenza and pneumonia, except pneumonia of newborn	31	100.0	64.5	19.4	9.7	6.4
All other	154	100.0	61.7	21.4	14.3	2.6

* Figures adjusted to represent one-tenth of the deaths for the three-month period, that is, the number of deaths in the Current Mortality Sample.

as very good or good for every death from the leukemias and lymphomas.

Consistency of Medical Certification—The medical certifications were then rated with respect to consistency with the diagnostic information reported. The results of this rating are shown in Table 4. This review indicated that the reported causes were the most probable diagnoses in 79 per cent of the deaths, other diagnoses appeared equally probable in 13 per cent, and in 5 per cent another diagnosis was preferred. In about 4 per cent of the cases, no diagnostic evidence was presented. The certifications appeared more open to question in the medicolegal cases where 61 per cent of the 232 certifications were categorized as the most probable diagnosis. Virtually all of the 116 deaths for which another diagnosis was preferred resulted from changes in the certifier's diagnosis, usually attributable to additional information obtained after the death certificate was filed. The certifying physician changed his cause-of-death statement for 5 per cent of the deaths in the sample. This proportion did not vary significantly by cause. The reviewer agreed with the certification change in most instances.

Diabetes, malignant neoplasms, and tuberculosis ranked high in representing the most probable diagnosis according to the medical review of the diagnostic evidence. Over 85 per cent of deaths attributed to these causes were judged to be the most probable diagnosis.

There seemed to be little question about accepting the diagnosis of malignant neoplasm for most sites. Stomach and pancreas were two exceptions, where the evidence presented was much less convincing in the support of the diagnosis.

While the quality of diagnostic information for the cardiovascular-renal deaths leaves something to be desired, it is clear from Table 4 that the medical certifications given represent the most probable diagnoses, and, as a rule, are preferable to other diagnoses which might be advanced. The figures may understate the quality of medical certifications for the total of the cardiovascular-renal diseases since the judgments were made in terms of the specific diagnoses reported. Some classified as "another diagnosis equally probable" or "another diagnosis preferred" could well have been the "most probable diagnosis" had the cause-of-death statement referred to another related disease within the cardiovascular-renal system.

Quality of Diagnostic Inference—As previously stated, the reviewer scored (a) the amount and kind of diagnostic information reported, and (b) the reasonableness of the inference drawn by the medical certifier on the basis of the diagnostic data given. In addition, the reviewer gave his own opinion as to the certitude of the diagnosis reported on the basis of the information at hand. The three scores were then combined and grouped into four categories, namely, solidly established diagnosis, reasonable diagnosis, diagnosis in doubt, and diagnosis probably wrong. These categories resemble the measures presented in Table 4. However, because the combined index also took into account the amount and kind of diagnostic data reported and the reviewer's opinion of certitude, it may be considered a more balanced assessment.

Table 5, which excludes medicolegal cases, shows the distribution of the reviewer's evaluation by cause. For all causes in the Pennsylvania sample, 43 per cent of the medical certifications appear to have been solidly established, and an additional 36 per cent seemed to be reasonable diagnoses. In 10 per cent there was some question as to whether the cause of death statement was right or wrong, and for 8 per cent of the death certificates, the cause, as stated originally, was probably wrong. In 4 per cent no information on diagnos-

Table 5—Reviewer's Evaluation of Diagnostic Information on the Deaths Certified by Physicians: Pennsylvania Sample, Three-Month Period, 1956

(Excludes 232 medicolegal cases. Deaths for which no information was reported are included in totals. For category numbers of causes, see Table 3)

Cause of Death	Total Number	Per cent Distribution				
		Total	Diagnosis of Cause of Death*			
			Solidly Established	Reasonable	In Doubt	Probably Wrong
Total Weighted Sample †	1,890	100.0	42.7	36.0	9.6	7.5
Tuberculosis, all forms	25	100.0	72.0	12.0	0	4.0
Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues †	433	100.0	67.7	14.1	7.4	7.2
Malignant neoplasm of digestive organs and peritoneum of stomach	185	100.0	65.4	13.0	9.2	8.1
Malignant neoplasm of respiratory system †	47	100.0	44.7	21.3	10.6	19.1
Of trachea, and of bronchus and lung specified as primary	58	100.0	61.1	21.8	12.4	5.0
Of lung and bronchus, unspecified as to whether primary or secondary	21	100.0	61.9	23.8	4.8	4.8
Malignant neoplasm of breast and female genital organs	33	100.0	57.6	21.2	9.1	6.1
Malignant neoplasm of male genital organs	66	100.0	81.8	9.1	4.5	1.5
Malignant neoplasm of urinary organs	20	100.0	65.0	25.0	5.0	0
Malignant neoplasm of lymphatic and hematopoietic tissues	16	100.0	87.5	6.3	6.3	0
Diabetes mellitus	28	100.0	89.3	10.7	0	0
Major cardiovascular-renal diseases †	60	100.0	50.0	36.7	6.7	5.0
Vascular lesions affecting central nervous system †	1,194	100.0	32.8	46.5	10.3	6.0
Rheumatic fever and rheumatic heart disease	236	100.0	31.8	53.8	7.2	2.1
Arteriosclerotic heart disease so described †	38	100.0	58.0	23.7	7.9	2.6
Heart disease specified as involving coronary arteries †	260	100.0	30.0	51.9	9.2	3.5
Hypertensive diseases †	271	100.0	39.1	45.0	10.7	3.0
Other cardiovascular-renal diseases †	128	100.0	32.8	40.6	16.4	3.1
Influenza and pneumonia, except pneumonia of newborn	261	100.0	26.4	42.1	11.1	17.2
All other	30	100.0	20.0	40.0	16.7	16.7
	148	100.0	45.9	18.9	12.2	20.3

* See footnote on Table 6 for criteria.

† Figures adjusted to represent one-tenth of the deaths for the three-month period, i.e., the number of deaths in the Current Mortality Sample.

tic procedures and methods was given to permit an evaluation. As stated previously, most of the decisions of "probably wrong" diagnoses were concurred in by the reporting physician.

For malignant neoplasms of all sites 65 per cent may be regarded as solidly established. This is slightly lower than the proportion of deaths with "very good" supporting diagnostic information since the "very good" data may have proved indecisive. An additional 14 per cent fell into the category of "reasonable diagnosis."

In contrast, the cardiovascular-renal disease had a much lower proportion of solidly established diagnoses, 33 per cent, compensated by a higher proportion of reasonable diagnoses, 47 per cent. The results indicated more uncertainty concerning the accuracy of diagnoses in the hypertensive diseases and the residual group of cardiovascular-renal diseases. The query form was probably weakest in eliciting clinical evidence which, in part, may account for the lower proportion of solidly established and reasonable diagnoses for these rubrics.

Table 6 compares for all causes the reviewer's evaluation and the physician's certitude of diagnosis given in response to a specific question on the query form. This comparison should not be construed as representing two independent ratings, since, in some instances,

Table 6—Reviewer's Evaluation as Compared with Physician's Opinion of Certitude of Diagnosis: Pennsylvania Sample, Three-Month Period, 1956

Reviewer's Evaluation	Total Hours	Physician's Opinion of Certitude			
		Positive	Reasonably Certain	Somewhat Uncertain	Very Uncertain
Total	1,789	1,032	580	28	13
Solidly established	775	632	119	1	6
Reasonable diagnosis	664	283	344	15	3
In doubt	168	64	75	11	1
Probably wrong	106	53	42	0	3

Ratings based upon following 3-digit combinations of factors:

Solidly established 111, 211, 112
Reasonable 212, 312, 311
In doubt 113, 213, 313, 323, 123, 122, 132
Probably wrong 324, 333, 334, 134, 133, 234, 124, 224, 233, 223

Where the first digit of the 3-digit combination denoted the diagnostic information available to certifier

1. Very good
2. Good
3. Sketchy

the second digit of the 3-digit combinations denoted the validity of diagnosis as stated on death certificate

1. Most reasonable inference
2. Another diagnosis equally probable
3. Another diagnosis preferred

and the third digit of the 3-digit combinations denoted the certitude of reviewer of the diagnosis

1. Positive
2. Reasonably certain
3. Somewhat uncertain
4. Uncertain

the reviewer took account of the physician's opinion in his evaluation. The cross-tabulation was restricted to cases for which the medical certification remained unchanged, since in the other situation it was uncertain whether the physician's certitude related to the original or revised certification. Some anomalies such as the reviewer's evaluation of "solidly established" or "reasonable diagnosis" in the presence of a physician's opinion of "somewhat uncertain" or "uncertain" can be usually accounted for by data available to the reviewer and not to the certifier. For example, the certifier might have had at his disposal only hearsay evidence for a patient referred to him for terminal care. In writing to the original diagnostic sources for further information, unequivocal evidence was elicited in many instances.

A comparison of the reviewer's evaluation and the certifying physician's opinion of certitude of his diagnoses shows some lack of agreement. In general, the certifier was more certain of the accuracy of the diagnoses than the reviewer. For example, in 90 per cent of the medical certifications the physician was positive or reasonably certain of the diagnoses, while the reviewer rated 80 per cent of the diagnoses as "solidly established" or "reasonable." One likely explanation deals with a common problem in the recording of information. The certifier may have had in mind unreported information which played an important part in firming up his opinion of certitude. Still another possibility is that the reviewer did not receive from the condensed report quite the impression which the certifier meant to convey. These factors may account for some of the 95 deaths, or about 5 per cent of the physician's certifications where the reviewer felt that the medical certification was probably incorrect de-

spite the certifier's expression of confidence in his diagnosis. As mentioned before, some of those judged probably incorrect could have been correct had the cause-of-death statement referred to another disease within the same organ system. Despite the discrepancies noted, the table still gives a strong impression of basic agreement between the certifier and reviewer.

Other Factors Associated with Diagnostic Quality—The reviewer's evaluation of diagnostic quality were then examined with respect to several characteristics of the decedent and the certifier, including the decedent's sex, age, and place of residence, and the certifier's age, specialty, place of practice, and length of attendance on the case.

Further analysis of diagnostic quality shows that the study of cardiovascular-renal mortality differentials by sex, for example, should take into account the better quality of diagnoses for males. The proportion of diagnoses solidly established is 36 per cent for males and 30 per cent for female decedents. In the more usual situation where the interest is in reasonable diagnosis or better, this factor does not appear to be important. For other causes, the sex difference in the proportion of solidly established diagnoses was not important.

By age, the quality of diagnosis falls off for deaths in the older ages. After age 65, the quality becomes progressively poorer for malignant neoplasms. This suggests that the analysis of cancer mortality might emphasize data under 75 years of age. For the cardiovascular-renal diseases, there is not the same degree of change by age. However, there is a sharp dip for the age group 45–54 years occurring in both sexes, the reasons for which may merit further study. The poorer quality of diagnostic data in the older ages is probably linked with the medical problems presented by these patients. The patient's condition may be such that aggressive attempts to reach a definitive diagnosis are not made because they would not be helpful in treatment.

Data by place of residence show slight differences by population size, but these do not seem large enough to account for much of the observed urban-rural differences in mortality.

The results by length of time the certifier had attended the patient before death were inconclusive, partly because of the proportion on which this item was not answered. One might have expected a strong association between length of attendance and quality of diagnosis. However, the present study made it clear that in many instances the physician last in attendance was able to take account of diagnostic information developed by others.

There seemed also to be a marked urban-rural difference in the quality of diagnoses according to the physician's place of practice. About 80 per cent of the diagnoses of urban medical practitioners were rated as "solidly established" or "reasonable" while 70 per cent of the diagnoses of their rural colleagues fell into that category. The same order of difference was apparent for diagnoses involving malignant neoplasms and cardiovascular-renal diseases.

Discussion

Within the limits of prevailing medical knowledge, the accuracy and completeness of cause of death statements depend upon (1) availability of pertinent diagnostic information, (2) diagnostic acumen on the part of the physician, and (3) the manner in which diagnoses are reported on the death certificate. This paper deals with the first factor; the third will be discussed in another paper.

The problem of diagnostic acumen, although a basic factor, was not evaluated in this study. In general, the reported diagnoses were accepted if suffi-

ciently supported by proper diagnostic tests and methods. Errors are possible even in those cases where the diagnoses are rated as "solidly established."

Other investigators have approached the diagnostic accuracy problem by comparing the medical certification with findings for deaths coming to autopsy. However, it is frequently difficult to relate the pathological findings to each other or to the sequence of events leading to death. Furthermore, diagnoses of clinical entities cannot always be established by autopsy findings. For example, James, et al.,[3] reported that the use of autopsy data, including a clinical summary, as a standard of reference decreased the proportion of deaths assigned to such causes as diabetes and hypertensive heart diseases and increased the proportion attributable to arteriosclerosis. In discussion, they suggested that "the lack of clinical information or the lesser attention given to this group of diseases by pathologists may be a partial answer for these differences. . . ." They commented further that "in certifying these deaths, the physician may have given more weight to clinical information than did the pathologist." Such a course of action is understandable and appears proper. It would seem highly undesirable to emphasize the pathological aspects of death without giving due weight to the clinical findings.

In practice, the comparison of death certificates with autopsy findings has suffered from a defect similar to that encountered in this study—that is, the third-party review takes account only of recorded information. Unless the reported data are complete and accurate, serious problems of misinterpretation will arise.

In the present study, the internist took into consideration both the reported clinical and pathological information. This approach has its shortcomings, some of which might be overcome by modifying the data collection method. One improvement would be to follow the pattern of clinical or clinical-pathological conferences where the principal disciplines associated with the case would present the facts and discuss the significance of the findings. This method is feasible only for deaths occurring within a single institution. To permit generalizations of findings applicable to all deaths within a study area, a broader coverage of deaths, not restricted to a single institution is needed. Here the query approach for a sample of deaths could be supplemented by interviews conducted by an internist with persons who have some knowledge of medical aspects of the case.

Although only one internist conducted the review in this study, provision for additional reviewers would probably not alter the results substantially. More important is the choice of criteria for the evaluation of the reported diagnostic methods and findings. The criteria adopted for this study appeared sufficiently discriminating and did not give rise to many classification difficulties.

While tentative and preliminary, the results of this approach appear promising enough to warrant further trial and development. The method holds special promise for the interpretation of time trends and regional differences in mortality for specific causes of death. When confronted with mortality differentials, the question arises as to whether the observed difference is real or a reporting artifact. In this connection, one of the more difficult problems has been in assessing the reliability of diagnostic information on death certificates. The systematic collection of additional data of the type reported here should be of material assistance in indicating whether diagnostic differences could be an important complicating factor in the interpretation of the mortality data.

The results reported for Pennsylvania may turn out to be descriptive for other

northern states. More data are needed and further work should be done on a national scale to explore the nature of regional differences. Some thought should be given to the periodic collection of data for the interpretation of national trends in mortality for specific causes. The results suggest that the cardiovascular-renal diseases present the greatest problems in interpretation and special attention should be given to investigations in that area. The effectiveness of a supplementary query program can unquestionably be improved by restricting the inquiry to a single disease.

This approach to the collection of supplementary data offers some additional advantages. For example, the Pennsylvania experience indicates definitely that it is feasible to collect data on histologic type of cancer of specific sites as part of a supplementary query. For reasons which will not be elaborated here, it cannot be expected that such information can be obtained from the medical certification.

Absolute and unfailing accuracy of ante-mortem diagnoses are unattainable goals. Although there are opportunities to secure additional information post mortem, insistence on absolute precision of diagnosis for the purposes of preparing cause-of-death statements appears wholly unreasonable. There should be a more general recognition that mortality data are not precise measures but that they are useful in suggesting leads to be elaborated by other study approaches. The results of this study suggest that the diagnostic data for many disease categories in Pennsylvania, at least, are more than adequate for this purpose.

REFERENCES

1. Swartout, H. O., and Webster, R. J. To What Degree Are Mortality Statistics Dependable? A.J.P.H. 30:811 (July), 1940.
2. Pohlen, K., and Emerson, H. Errors in Clinical Statements of Causes of Death. Ibid. 32:251 (Mar.), 1942; 33:505 (May), 1943.
3. James, G.; Patton, R. E.; and Heslin, A. S. Accuracy of Cause-of-Death Statements on Death Certificates. Pub. Health Rep. 70:39 (Jan.), 1955.
4. Nicoll, M. Jr., and Bellows, M. T. Effect of a Confidential Inquiry on the Recorded Mortality from Syphilis and Alcoholism. A.J.P.H. 24:813 (Aug.), 1934.
5. Haenszel, W.; Moriyama, I. M.; and Sirken, M. G. "A Proposed Study for Extending the Scope and Improving the Quality of Mortality Data," in Improving the Quality of Statistical Surveys. p. 57. Washington, D. C.: American Statistical Association, 1956.
6. Dorn, H. F., and Horn, J. I. The Reliability of Certificates of Death from Cancer. Am. J. Hyg. 34:32 (July), 1941.
7. Haenszel, W.; Marcus, S. C.; and Zimmerer, E. G. Cancer Morbidity in Urban and Rural Iowa. Pub. Health Monograph No. 37, PHS Pub. No. 462, 1956.

Dr. Moriyama is chief, Mortality Analysis, National Office of Vital Statistics; Dr. Baum, formerly assistant director, National Cancer Institute, is now with the Indian Health Service, Public Health Service, Washington, D. C.; Mr. Haenszel is head, Demography Section, Biometry Branch, National Cancer Institute, Bethesda, Md.; and Dr. Mattison, formerly secretary of health, Pennsylvania State Health Department, is executive secretary, American Public Health Association.

This paper was presented before a Joint Session of the Epidemiology and Statistics Sections of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 11, 1957.

Order statistics are concerned with the rank as well as the magnitude of observations. Application of the technics found in order statistics is shown in three instances in this paper.

APPLICATIONS OF ORDER STATISTICS TO HEALTH DATA

Bernard G. Greenberg, Ph.D., F.A.P.H.A., and Ahmed E. Sarhan, Ph.D.

ORDER STATISTICS is that body of knowledge which utilizes the rank or order of an observation as well as its magnitude. It combines the technics of conventional statistics (which consider the magnitude of the observation) with those of rank order statistics (which consider only the relative rank whether or not the original observations were measured on an ordinal scale). The applications of order statistics have been generally of the following two classes:

1. Instances in which short-cut or time-saving devices are appropriate for problems of estimation and/or tests of significance. The estimates and short-cut tests do not always attain the highest power-efficiency but may be preferred because of ease or rapidity of calculations without great sacrifice in efficiency. For example, use of the median to estimate central tendency, use of the range to estimate dispersion, or an entire short-cut analysis of variance as suggested by Hartley.[6]

2. Applications in which no other known technic provides a suitable answer with as high a power-efficiency. Such instances occur, for example, with censored data and in deciding how to form groups or intervals for a frequency distribution.

The first class of applications in order statistics is well known and the single illustration to be given here will be a new one in estimation that has not yet been made available elsewhere. Owing to the fact that the second class of applications is less well known, two examples will be presented to illustrate uses of order statistics with highest efficiency.

Censored Observations

The word censored is applied to cases where the sampling is from an unrestricted population but the exact values of some observations in the sample are unknown because a barrier has been imposed either by the observer or the measuring process. The number of censored observations in the sample is known as well as their rank relative to this barrier or point of censorship. For example, the response to a drug may be so rapid that the reaction occurs before the experimenter can measure it, or so feeble that it is below the smallest level of measurement. This censoring is at the left extreme of the distribution of values. Censoring may occur at the other extreme of the distribution when measuring an event such as the incubation period of a disease. The observer may not have sufficient time or facilities to await the development of the phenomenon in all cases, and decides to censor the observations on the d^{th} day (Type I censoring) or after p per cent of the experimental units have already responded (Type II censoring). In the latter case, the magnitude of the terminal observation is known but not the point of censorship on the x-axis.

Censored observations are not to be confused with the term truncated which is applied to observations obtained when the sampling is from a restricted population. The numbers of observations that would have occurred in a sample above and below the truncation point are unknown. For instance, if one were to study heights of American military personnel, the sample would be from a truncated population of heights. Members of the military forces were previously screened to eliminate those falling below minimum or above maximum allowable heights.

Order statistics can provide the most efficient linear, unbiased estimates of parameters, such as the mean and standard deviation, when the sample has been censored, particularly by Type II censoring. The following data illustrate the technic of calculation.

The data are taken from Sarhan and Greenberg [12] and represent a sample of ten individual systolic blood pressure readings. For technical reasons in measurement, 20 per cent of the smallest and 30 per cent of the largest observations were censored leaving only five central values. The problem is to estimate the mean and standard deviation of the population knowing the magnitude of the five central values and only the relative position of the five censored observations.

The data are arranged in size order in the following table along with the coefficients, selected from tables in Sarhan and Greenberg (loc. cit.). These coefficients are predetermined to provide the best, linear unbiased estimate of the mean and standard deviation of the population when two values are censored on the left-hand side and three on the right-hand side of a sample of size 10.

Ordered Observations	Coefficients for Mean	Coefficients for Standard Deviation
1. Censored	0	0
2. Censored	0	0
3. 108	0.2050	-0.8898
4. 111	0.1038	-0.1101
5. 119	0.1122	-0.0262
6. 121	0.1198	0.0549
7. 125	0.4592	0.9711
8. Censored	0	0
9. Censored	0	0
10. Censored	0	0
Estimates	118.9	16.6
Variance (in terms of σ^2)	0.1180	0.1713
Efficiency relative to uncensored sample (%)	84.78	33.62

The calculations are as follows:

$$\mu^* = 108\ (0.2050) + 111\ (0.1038) + \ldots + 125\ (0.4592) = 118.9$$

$$\sigma^* = 108\ (-0.8898) + 111\ (-0.1101) + \ldots + 125\ (0.9711) = 16.6$$

In the foregoing table, the variance of each estimate is also given as quoted from the reference previously cited.

Below the variance of each estimate, the precision-efficiency of the sample relative to the complete or uncensored sample is also shown. Thus, the estimate of the mean is 84.78 per cent as efficient as it would have been if the

exact magnitude of all ten values were known instead of only five of them.

Simplified Statistics

In the foregoing example, the estimate of the mean was 85 per cent efficient although 50 per cent of the sample values only were known. If the efficiency of estimating the mean were to be maximized with 50 per cent of the sample observations, the selection of the five known values might not be the ones used previously. In fact, a field of linear systematic statistics has developed in which interest lies in using short-cut procedures with relatively high efficiency. In general, the estimation problem has been to make maximally efficient estimates of the mean and standard deviation of a population using 1, 2, 3, . . ., $k < n$ sample elements.

The second example will illustrate this procedure with the exponential distribution because the estimation problem with this distribution has not been attempted before. The data come from Table 1 of Maguire, Pearson and Wynn,[8] and represent the time intervals in days between explosions in mines involving more than ten men killed from December 6, 1875, to May 29, 1951. The 109 observations have been rearranged in size order as follows:

Table 1—Time Interval in Days Between Explosions in Mines Involving More Than Ten Men Killed

Order	Observation	Order	Observation	Order	Observation	Order	Observation
1	1	31	59	61	188	91	354
2	4	32	59	62	189	92	361
3	4	33	61	63	195	93	364
4	7	34	61	64	203	94	369
5	11	35	66	65	208	95	378
6	13	36	72	66	215	96	390
7	15	37	72	67	217	97	457
8	15	38	75	68	217	98	467
9	17	39	78	69	217	99	498
10	18	40	78	70	224	100	517
11	19	41	81	71	228	101	566
12	19	42	93	72	233	102	644
13	20	43	96	73	255	103	745
14	20	44	99	74	271	104	871
15	22	45	108	75	275	105	1,205
16	23	46	113	76	275	106	1,312
17	28	47	114	77	275	107	1,357
18	29	48	120	78	286	108	1,613
19	31	49	120	79	291	109	1,630
20	32	50	123	80	312		
21	36	51	124	81	312		
22	37	52	129	82	315		
23	47	53	131	83	326		
24	48	54	137	84	326		
25	49	55	145	85	329		
26	50	56	151	86	330		
27	54	57	156	87	336		
28	54	58	171	88	338		
29	55	59	176	89	345		
30	58	60	182	90	348		

The single one-parameter exponential distribution represented by

$$f(x) = \begin{cases} \frac{1}{\sigma} e^{-\frac{x}{\sigma}}, & x > 0 \\ 0, & \text{otherwise} \end{cases}$$

has been shown to fit these data quite nicely. If the two-parameter exponential distribution must be used, a simple transformation of location can be used.

The estimate of the standard deviation σ, using all observations, is equal to 241 days. To estimate the value of σ using $k < n$, tables for $k = 1, 2, \ldots, 15$ are available for the exponential distribution in a recent paper by Ogawa.[11] For example, if $k = 5$ were selected, the relative efficiency to the complete sample estimate would be 94.76 per cent. From Ogawa's table of optimum spacings for $k = 5$, one also learns that the five sample observations which are best to use are as follows:

$$k_1 = (109)(0.39347) + 1 = 43$$
$$k_2 = (109)(0.67044) + 1 = 74$$
$$k_3 = (109)(0.84433) + 1 = 93$$
$$k_4 = (109)(0.94387) + 1 = 103$$
$$k_5 = (109)(0.98855) + 1 = 108$$

The coefficients in the above formulation, viz., 0.39347, 0.67044, . . ., 0.98855 were obtained from Ogawa's Table 2 and the calculations are rounded to the lowest whole integer. Using that same table for determining the weighting coefficients, the calculations for σ^* are as follows:

Observation Number	Observation (X_{n_i})	Coefficient (a_i)
43	96	0.34480
74	271	0.23108
93	364	0.13902
103	745	0.07037
108	1,613	0.02412

$$\text{Then, } \sigma^* = \sum_{i=1}^{5} (X_{n_i})(a_i) = 238.0.$$

This compares favorably with the values of 241 calculated from the complete sample. If $k = 10$ were chosen, the efficiency would have risen to 98.32 per cent and the value of $\sigma^* = 242.6$.

If the parameters of the normal distribution are to be estimated by simplified statistics, an earlier paper by Ogawa [10] provides the optimum spacings for that distribution. Although Ogawa's spacings are optimal, other combinations of sample observations may be much more convenient to use without any great sacrifice in precision. Such systematic statistics can be found in Mosteller,[9] Dixon,[3] and Lott.[7]

The particular example chosen to demonstrate Ogawa's tables for shortcut estimation with the exponential dis-

Table 2—Infant Deaths, by Age at Death, United States, 1955

Age at Death	Number
Under 1 hour	8,008
1 hour or over, under 1 day	32,472
1 day or over, under 2 days	11,692
2 days or over, under 3 days	7,449
3 days or over, under 4 days	3,783
4 days or over, under 5 days	2,232
5 days or over, under 6 days	1,739
6 days or over, under 1 week	1,279
1 week or over, under 2 weeks	4,374
2 weeks or over, under 3 weeks	2,475
3 weeks or over, under 4 weeks	1,848
Over 4 weeks, under 2 months	6,571
Over 2 months, under 3 months	5,008
Over 3 months, under 4 months	3,858
Over 4 months, under 5 months	3,125
Over 5 months, under 6 months	2,517
Over 6 months, under 7 months	2,094
Over 7 months, under 8 months	1,679
Over 8 months, under 9 months	1,459
Over 9 months, under 10 months	1,177
Over 10 months, under 11 months	1,049
Over 11 months, under 1 year	1,015
Total	106,903

Source: Infant Mortality. Vital Stat. Special Rep., Vol. 46, No. 14, Table 4. Washington, D. C.: National Office of Vital Statistics, (Aug. 22), 1957.

tribution might not be convincing because the most efficient estimate of σ can be obtained by the straightforward arithmetic mean of the 109 values. Let us consider, however, large series of observations such as the distribution of infant deaths, by age of death, which also follows the one-parameter exponential distribution.

The distribution of deaths under one year of age in the United States for 1955 is given in Table 2.

Suppose the distribution of infant deaths in Table 2 is to be used as an independent check of the separation factor employed in a life table to calculate life expectancy—that is, the average age of death under one year of age is desired.

If the average age at death is to be estimated with five observations rather than the total of 106,903, the values chosen would be as follows:

Observation Order Number	Age at Death (Days)
42,064	1.14
71,673	11.83
90,262	100.36
100,903	216.77
105,679	324.02

This procedure leads to an average age at death equal to 40.2 days. Dividing this by 365, the separation factor would be: $\frac{40.2}{365} = 0.110$. The separation factor used in the abridged life tables for 1955 [1] is as follows:

$$f_0 = \frac{L_0 - l_1}{d_0} = \frac{97{,}670 - 97{,}354}{2{,}646} = 0.119.$$

The discrepancy between the two values, although slight, is not caused by the fact that the former is based upon only five observations. The method of estimating the life table separation factor for infants under one year of age, proposed by Greville,[5] is easily shown to be a slight overestimate. This fact is confirmed in the present example.

The advantage of Ogawa's short-cut method of estimating the actual average age at death is that with $k = 5$ the distribution of the first 39 per cent of the deaths need not be known exactly. Furthermore, if the estimate were to be based upon $k = 3$ optimally spaced points, less than one half (or the last part) of the distribution of deaths need be known. This would be a boon in countries where deaths under one week are not classified by days.

Grouping Problem

In the foregoing section, the objective was to estimate parameters by short-cut methods without great sacrifice in precision-efficiency. In an important recent development, it was learned that some of these optimum spacings, originally derived for short-cut procedures, had another and perhaps more interesting property for the grouping of data into frequency distributions.

Suppose there are available observations on a continuous variable and it is desired to classify them, or the population from which they were drawn, into k groups. This might be done either for purposes of convenience in exposition, calculation, or for simplification in the collection of further observations. Thus, if heights of individuals are to be classified as tall, medium and short, the problem is to locate the dividing lines to be drawn without restricting ourselves either to equally spaced groups or groups with equal expectation of frequency of observations. The criterion for grouping is that if the observations in a group are to be represented by a group central value, the loss in efficiency by this procedure should be a minimum. Furthermore, if this classification is carried out, the loss of efficiency in $k = 2, 3, 4, \ldots$ groups is also of interest.

This same problem occurs when there

are measurements on two continuous variables for a given sample. The experimenter, instead of testing the correlation between the two variables, may prefer for reasons of exposition to group the x variable into k classifications so as to maximize the test of the differences in the y variable among groups by an analysis of variance. Regardless of the correlation between the two variables, Cox [2] has recently shown that the solution for grouping the x variable comes down to the problem of optimum spacings if the distribution is normal. Thus, if sample data were available on heights and weights, classification of the individuals into tall, medium, and short could be accomplished optimally by dividing the range of heights such that the tall and short groups each had 27.027 per cent of the observations and the medium group had the remaining 45.946 per cent. This means that the limits of the three intervals would be as follows in a unit normal distribution:

Short: $-\infty$ to -0.612
Medium: -0.612 to $+0.612$
Tall: $+0.612$ to $+\infty$

The loss of precision of this arrangement by substituting one of the group values for the exact individual observation results in an efficiency of 80.98 per cent. In fact, the optimum groups and efficiencies can be obtained for $k = 2, 3, \ldots, 6$ in Cox's paper and for $k = 2, \ldots 11$ in Ogawa.[10] The former's values are more nearly precise in the last decimal place than those of Ogawa's and certain results of Cox are reproduced in Table 3 here for convenience.

The information in Table 3 indicates that the substitution of a binomial classification ($k = 2$) for a normal variate results in an efficiency of 63.66 per cent. This particular figure of efficiency may

Table 3—Optimum Grouping Intervals for Unit Normal Distribution with Percentage Distribution of Observations and Efficiency

k	Group Limits	Percentage Distribution	Percentage Efficiency Relative to Exact Observation
2	$-\infty$ to 0	0.500	63.66
	0 to $+\infty$	0.500	
3	$-\infty$ to -0.612	0.270	80.98
	-0.612 to $+0.612$	0.459	
	$+0.612$ to $+\infty$	0.270	
4	$-\infty$ to -0.980	0.164	88.25
	-0.980 to 0	0.336	
	0 to $+0.980$	0.336	
	$+0.980$ to $+\infty$	0.164	
5	$-\infty$ to -1.230	0.109	92.01
	-1.230 to -0.395	0.237	
	-0.395 to $+0.395$	0.307	
	$+0.395$ to $+1.230$	0.237	
	$+1.230$ to $+\infty$	0.109	
6	$-\infty$ to -1.449	0.074	94.20
	-1.449 to -0.660	0.181	
	-0.660 to 0	0.245	
	0 to $+0.660$	0.245	
	$+0.660$ to $+1.449$	0.181	
	$+1.449$ to $+\infty$	0.074	

be helpful in estimating required sample sizes in some experiments where there is no experience, with a variable to be measured but there is some information on a binomial plane.

There are two points worth mentioning about the use of results in this section. The first is that solution for optimum groupings is identical to optimum spacings for the estimation problem in the case of the normal distribution. This does not appear to be true in general, however, and the rectangular distribution is a case in point.

Second, after grouping has been performed, whether by the methods outlined here or not, the estimation of the mean and standard deviation will be made by referring the observations in a group to some central value of that group. Ordinarily, Sheppard's corrections are applied during this step if the groups are equidistant. These corrections may lead to inconsistent estimates for both the mean and standard deviation even when the group is equidistant. Consistent estimates for both the mean and standard deviation can be made by maximum likelihood according to the method outlined by Gjeddeback.[4]

Summary

The uses of recent contributions to the technics found in order statistics have been applied in three instances. The first is in the case of censored observations with the normal distribution. The second application involves shortcut estimation of the parameter of the exponential distribution using $k < n$ of the sample elements. The final illustration concerns the grouping of continuous data into frequency classifications.

REFERENCES

1. Abridged Life Tables: United States, 1955. Vital Statist. Special Rep. Vol. 46, No. 9 (July 2), 1957, Table 1.
2. Cox, D. R. Note on Grouping. J. Am. Statist. A. 52:543–547, 1957.
3. Dixon, W. J. Order Statistics. Mimeographed notes.
4. Gjeddeback, N. F. Contribution to the Study of Grouped Observations. Skandinav. Aktuarietidskrift 42:136–159, 1939.
5. Greville, Thomas N. E. United States Life Tables and Actuarial Tables, 1939–1941. Washington, D. C.: Gov. Ptg. Office, 1946, pp. 117–118.
6. Hartley, H. O. The Use of Range in Analysis of Variance. Biometrika 37:271–280, 1950.
7. Lott, Fred W., Jr. The Use of a Certain Linear Order Statistics, Related to the Mean Difference, as an Unbiased Estimate of the Standard Deviation in Finite and Infinite Populations. Doctoral dissertation (1955), University of Michigan, Ann Arbor.
8. Maguire, B. A.; Pearson, E. S.; and Wynn, A. H. A. The Time Interval Between Industrial Accidents. Biometrika 39:168–180, 1952.
9. Mosteller, Frederick. On Some Useful "Inefficient" Statistics. Ann. Math. Statist. 17, 4:377–408 (Dec.), 1946.
10. Ogawa, Junjiro. Contributions to the Theory of Systematic Statistics, I. Osaka Math. J. 3, 2:175–213 (Dec.), 1951.
11. ———, A Further Contribution to the Theory of Systematic Statistics. Institute of Statistics Mimeo. Ser. No. 168, Chapel Hill, N. C. (Apr.), 1957.
12. Sarhan, A. E., and Greenberg, B. G. Estimation of Location and Scale Parameters by Order Statistics from Singly and Doubly Censored Samples. Part I. The Normal Distribution up to Samples of Size 10. Ann. Math. Statist. 27:427–451, 1956.

The authors are professor and research associate professor, respectively, Department of Biostatistics, School of Public Health, University of North Carolina, Chapel Hill, N. C. Dr. Sarhan is on leave of absence from the Cairo University, Gizah, Egypt.

This paper was presented before a Joint Session of the Biometric Society (Eastern North American Region) and the Statistics Section of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 13, 1957.

Sponsored by the Office of Ordnance Research, U. S. Army.

Sequential methods are used frequently in clinical trials and are applicable in other problems of interest to health workers. This paper discusses how to control more rigorously the risks of error in such methods.

SEQUENTIAL METHODS IN CLINICAL TRIALS

Peter Armitage, Ph.D.

THE NUMBER of published reports of clinical trials involving sequential analysis could be counted on the fingers of both hands. Yet if we define a sequential experiment as one in which the decision whether or not to stop at any stage depends on the observations so far made, there is little doubt that many published trials were in fact carried out sequentially, even though this was not admitted in the final report. It is worth considering why this should be so. The main reason is, I believe, an ethical one. The point has frequently been made that many interesting clinical trials could never be performed, as the physicians in charge would be convinced that one of the proposed treatments was better than another and would be unwilling to randomize patients between these two treatments, because to do so would be to withhold what they believed to be a superior treatment from half the patients under their care. This difficulty is well known to anyone working in this field. But there is a closely related difficulty which is not so frequently discussed. If, during the course of a trial which was started in good faith, an appreciable difference emerges between the effects of different treatments, sufficient to convince the physicians in charge that the difference is real, then they will be faced with the same ethical problem. Many investigators must therefore have examined the results collected at various stages of the trial, and some may well have decided to stop because the differences in response were unlikely to be due to random fluctuations.

We have here a problem very similar to that of optional stopping in parapsychological experiments. Feller pointed out a number of years ago [1] that the practice of stopping when apparently a certain level of significance has been reached has the effect of exaggerating the real significance of departures from a null hypothesis. It might be useful to consider how serious this effect would be in a typical medical trial. Suppose we plan a trial which requires an intake of patients over a period of five months. Suppose also that the response for any patient is obtained very quickly, so that at the end of one month we have complete records on almost 20 per cent of the patients, and so on. We might arrange to have our statistician analyze the results after one month and call a halt if the difference exceeds the 5 per cent significance level; otherwise we continue for another month, after which the statistician again examines the results, and so on. To examine the consequences of this system we should have to postulate exactly what sort of test was performed at each stage; but as a reasonable simulation of the situation, assume that the ith month's results are repre-

sented by a normal deviate χ_i, distributed with mean μ and unit variance, and that the test after i months is performed on $\chi_1+\chi_2+\ldots+\chi_i$, the null hypothesis being that $\mu=0$. Then by some rather laborious numerical integration it can be shown that the probabilities of stopping (and claiming a significant difference) at the various stages are 0.050, 0.033, 0.024, 0.019 and 0.015, adding up to 0.141. (If we went on forever, the sum would tend to unity.) The discrepancy between the apparent significance level of 5 per cent and the actual level of 14 per cent seems to me sufficiently serious to suggest that explicitly sequential methods, more rigorously controlling the risks of error, would be useful.

A number of different sequential schemes have been proposed for medical trials. The familiar Wald system [2] gives designs which require a relatively small number of observations for large departures from the null hypothesis (thus according fairly well with the ethical requirements) and which provide a long-term economy in terms of average sample number. However, the extreme variability of sample size is often a deterrent to the use of these schemes; a minimum average sample number may be less valuable in a medical trial which is individually hand-tailored than in an industrial inspection process which is used repeatedly on successive batches. Bross [3] suggested that truncated schemes were required (that is, schemes in which the maximum number of observations is fixed), and he provided two specially constructed designs for binomial sampling. In a recent paper [4] I have described a general method for obtaining truncated sequential designs with known probabilistic properties. All these designs give relatively low sample sizes for large differences between treatments.

I shall discuss in more detail a possible application of these truncated designs, which I have called "restricted sequential procedures"; first, I wish to make a few general remarks about them. Let us consider a situation in which the results are obtained in the form of a series of qualitative preferences between two treatments, A and B. This might arise if both treatments were given on the same subject, in a random order, and either the subject or the physician made a judgment as to which treatment seemed the more successful. Or the comparisons might be made between rather than within subjects, by arranging that the subjects were paired, either randomly or systematically, that one member of each pair was allocated at random to A and the other to B, and that a judgment was made as to whether the subject on A did better or worse than the subject on B. The method of comparing two proportions, which Wald describes in his book on sequential analysis,[5] and which Bross uses in his paper,[3] is a particular case of this second situation. Now, in all these instances the results are obtained as a series of preferences for A or B, say AABABBAAABA. . . . If the null hypothesis is true, that A and B have identical effects, we have a binomial sequence with the probability of A equal to one-half. If A is generally more effective than B, we shall tend to have more A's than B's in the long run, although it will not necessarily be true that the probability of A is constant.

Restricted procedures consist in sampling to boundaries like those shown in Figure 1. The abscissa is the number of preferences so far recorded. The ordinate is the difference between the number of A preferences and the number of B preferences. This can be expressed in a different way by saying that we start plotting a path at the origin; for each A preference we move one unit N-E, and for each B, one unit S-E. If the proportion of A's is near one-half, we shall tend to move in a horizontal direction and stop the trial

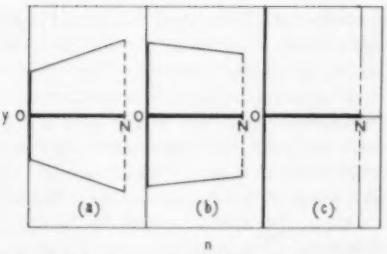


Figure 1—(a) and (b): Two Types of Restricted Sequential Procedure. (c): Fixed Sample Size Procedure. The Ordinate, y, is the Difference Between the Numbers of A and B Preferences; the Abscissa, n, is the Total Number of Preferences.

after N preferences (the absolute maximum). If the proportion of A's differs sufficiently from one-half, we shall tend to hit one of the two outer boundaries and stop earlier. Usually I think designs of type (a) will be preferable, but the theory also covers those of type (b). Notice that here the outer boundaries converge and that if we increase the steepness still further, we eventually approach type (c), which is just the fixed-sample-size procedure.

Suppose we decide that for some particular purpose a design of type (a) is suitable. There are at least two different approaches to the question of how to choose the appropriate boundaries. We could fix N to start with, on grounds of convenience; (there may occasionally be a definite upper limit to the amount of time which is available for the trial); we should then be able to work out the power of the procedure, i.e., the sensitivity with which it will detect differences from one-half in the probability of A's or B's. Alternatively, we could specify at the outset how powerful a procedure we required and then see what value of N this implied.

It is worth emphasizing that there will be many situations in which a sequential approach is inappropriate. It may be difficult to pick out any single criterion on which to base a stopping rule, because there may be a large number of different responses which it is important to analyze. In some of the large-scale trials, it may be necessary to fix the duration unambiguously at the outset for administrative reasons. In discussing these points some years ago,[2] I wrote that "a sequential approach is unlikely to be of value if the time required to assess the response of a subject to treatment is long in comparison with the period during which subjects enter the trial." I am now inclined to think that this statement requires reconsideration, and the rest of my paper will be essentially a discussion of this point.

I believe that all the sequential clinical trials which have so far been published have had one feature in common. The time elapsing between the treatment of any patient and the observation of his response has been short, so that if at any time the decision is made to stop the trial, only a small number of patients will at that instant be in the stage between treatment and response, and so only a small number of additional results have yet to come in. An example is provided by a recent trial [6] which compared the efficacies of two treatments for chronic cough in the first few days after treatment. It is usually assumed that sequential experimentation can be successfully carried out only under these conditions. Yet there have been and will be many trials in which each patient has to be followed for an appreciable period before an evaluation is possible. In some trials for cancer treatments, for instance, the main question may be whether the survival times are on the average longer for one treatment than for another, and this will involve follow-up periods of several years for some patients. The same ethical considerations apply in this, as in the other type of trial and indeed may be more cogent, since life and death are often at stake.

I want, therefore, to consider how sequential methods might be applied to this sort of trial.

The first point to be made is that whereas in trials with quick responses the sequential analysis may be based on the complete data and may be the only sort of statistical analysis required, in trials with long follow-up periods the sequential analysis will never constitute the final analysis of the data. After a stopping decision has been made we shall always want to collect more follow-up information on the patients already treated. This raises an interesting theoretical question. In making the final analysis, how do we take into account the fact that a stopping rule has been applied to some of the data? Insofar as the statistic used for the sequential analysis is positively correlated with the statistic used for the final analysis, there is presumably an effect similar to that already discussed—we tend to exaggerate the significance of departures from the null hypothesis. The effect may be small unless the correlation is high, but it would be useful to have a theoretical examination of this problem.*

Let us suppose that we are comparing two treatments, A and B, for which the survival time distributions after treatment are $F_A(t)$ and $F_B(t)$. That is, $F(t)$ is the probability that the survival time is less than t. We wish to test the null hypothesis that $F_A(t) = F_B(t)$ against alternatives of the type $F_A(t) > F_B(t)$ or $F_A(t) < F_B(t)$. At any time, T, after the start of the trial, the data will consist of a number of patients who have died at various times after treatment and a number who are still alive after various periods of observation. In a nonsequential situation, we should probably deal with data of this type by using life-table methods. An alternative approach might be to assume some functional form for $F_A(t)$ and $F_B(t)$ and estimate the parameters by, say, maximum likelihood, taking account of the various truncation points. Neither of these approaches appears to be easily adaptable to existing sequential methods, and I have recently been considering two less efficient methods which can easily be worked sequentially.

The first method is to pair the patients as they enter the trial, placing one member of each pair on treatment A and the other on treatment B. We then observe, for each pair, whether death occurs first for the patient on A or for the patient on B. We thus get a series of what I shall call "preferences" in favor of A or B. This approach was suggested to me in conversation by Dr. Richard Doll, but I do not know any instances of its use. At any time, T, a certain proportion of pairs still will not have experienced their first death and so will not be used in the analysis. Notice that, in general, the order in which the preferences are obtained will not be the same as that in which the pairs enter the trial. This might be called the *sign method*, since it is similar to the familiar nonparametric sign test, the only difference being that the preferences here are ordered in time. Now, any of the sequential methods which I mentioned earlier are well suited to deal with binomial sequences. On the null hypothesis that $F_A(t) = F_B(t)$, the A and B preferences occur with equal probabilities of one-half. But on alternative hypotheses that $F_A(t) \neq F_B(t)$, the preferences in general will not follow a binomial sequence with constant probability. A necessary and sufficient condition that we have a binomial sequence with constant probability is that

$$1 - F_A(t) = \{1 - F_B(t)\}^k,$$

i.e., one survival curve is a constant

* If the probability, on the null hypothesis, of curtailing the intake is, say, 0.05, I should conjecture that the chance of finding in the final analysis a departure "Significant" at the 5 per cent level will be between 0.05 and 0.08 (the latter value corresponding to the first two stages of the repeated process described earlier).

power of the other. This condition is satisfied in particular if the survival curves are exponential, i.e., $1 - F_A(t) = e^{-\lambda t}$, $1 - F_B(t) = e^{-\lambda' t}$.

The second method is to compare the proportions of patients who have survived for at least a period τ after treatment. This is a straightforward comparison of proportions which again can be handled sequentially. We can use for this comparison all patients who have been observed for at least τ, i.e., who entered the trial during the interval $(0, T-\tau)$.

Both these methods are clearly inefficient because they ignore a good deal of information which is available at time T, but this need not necessarily deter one from using them as the basis of a sequential stopping rule, realizing that an efficient analysis will be made after a full follow-up. In another paper[7] I have examined the efficiencies of these methods, in samples of fixed size, in the situation where the survival curves are exponential, with a very small difference between them. That is, I have compared the *asymptotic* efficiencies of the two quick methods, and also that of the life-table method, relative to a maximum-likelihood approach which is of course fully efficient. Without going into details here, I can summarize the results as follows:

1. When the survival times are short in relation to the length of the trial (i.e., for large values of λT), so that there are very few incomplete observations, the method of comparing survival rates is more efficient than the sign method, having a maximum efficiency of 65 per cent, as compared with 50 per cent for the latter. The life-table method also is 65 per cent efficient.

2. When the survival times are of the same order as the period of intake of patients (small λT), so that there is much incomplete data, the sign method is the best and approaches an efficiency of 100 per cent as λT approaches zero (compared with 50 and 82 per cent for the survival-rate and life-table methods, respectively). It only gets really near 100 per cent when the period of intake is so short that no method of analysis is much good! But it is precisely in the early stages of the trial that we wish the sequential scheme to be of use, so it would seem that the sign comparison is the method we want.

These results by no means resolve the whole problem, but as a first stab at it I think they indicate that the sign comparison might form the basis of a successful sequential approach. In practice I think it would be sensible to regard a stopping decision as a warning. That is, one would call a temporary halt to the intake of patients, do a life-table analysis on the available data, and see whether this confirmed the difference between the two series. If it did, then one would stop the trial. If not, I think one would continue. In any case, a final life-table analysis would be done after a fairly prolonged follow-up of the patients who had been treated.

As an illustration of these ideas, I have carried out an imaginary clinical trial by constructing hypothetical responses from random-sampling numbers. Let us suppose that we wish to compare two treatments for cancer by means of the survival curves. Patients are available for treatment at a uniform rate of 300 a year, and it is decided that the maximum duration of intake into the trial is 1½ years, which will give 450 patients (or 225 on each treatment). This maximum number may be decided either on administrative grounds or from the required power of the final fixed-sample-size analysis.

To see what value of N this implies, we have to ask how many preferences would become available in 1½ years, and the answer will depend on the actual survival rates for the two treatments. Let us make a guess that the average survival rates for the two treatments will be something like those shown in Table 1. (The survival rates at the longer periods are higher than would be given by exponential curves, but this feature tends to be observed in practice.) Then, it can be shown that if A and B both

Table 1—Assumed Mean Values of Survival Rate at Various Periods after Treatment

Years After Treatment	Survival Rate
0.5	0.60
1.0	0.45
2.0	0.30
3.0	0.22

follow curves of this type, or if these values are the geometric means of the survival rates for A and B, the numbers of preferences available at various times after the start of the trial are as shown in Table 2. The number of preferences is shown as a function of time by the continuous curve in Figure 2. Let us, then, choose a restricted procedure of type (a), with $N = 150$. The boundaries are shown in Figure 4. This has been choosen so that the error of the first kind (i.e., the probability of stopping before N preferences when the null hypothesis is true) is 0.05. It turns out that the power of this procedure is such that (with probability 0.95) we shall hit the upper boundary when the probability of an A is 0.67 and that of a B is 0.33. Now, a difference of this size would occur if one survival rate were the square of the other, and the two survival curves having this relationship to each other and at the same time giving the geometric mean survival rates tabulated in the foregoing, are shown as continuous lines in Figure 3.

Table 2—Numbers of Preferences Recorded at Various Periods after Start of Trial

Years After Start of Trial	No. of Pairs Tested	No. of Preferences Recorded
0.5	75	30
1.0	150	87
1.5	225	150

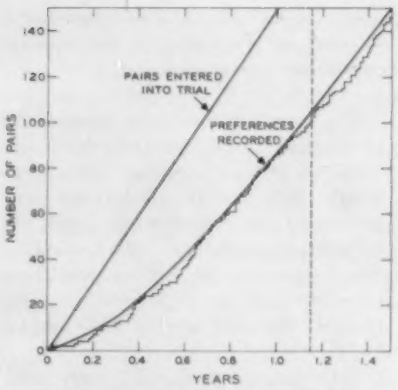


Figure 2—Rate of Intake of Patients and Rate of Accumulation of Preferences. The Continuous Lines Show Expected Values, the Zigzag Line Shows Actual Values. The Broken Line Is Drawn at 1.15 Years When Intake Stops.

I have constructed an artificial realization of a trial in which the two survival curves are those shown in Figure 3. The data for each pair of subjects were entered on one card, the pairs being allotted different times of entry to the

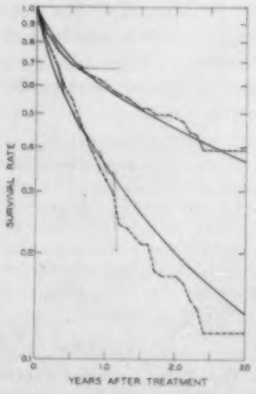


Figure 3—Assumed Survival Rates after Treatments A and B, with Life-Table Estimates from 1.15 Years' Intake of Patients —— True Rate; . . . Estimate after 1.15 Years; – – – Estimate after 2.95 Years.

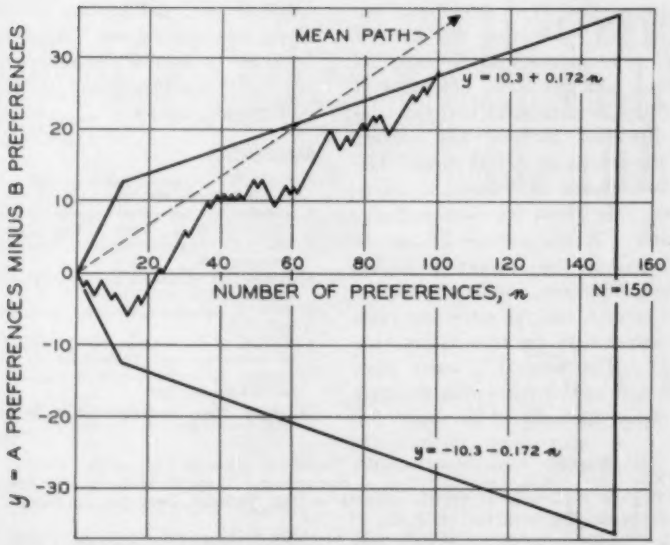


Figure 4—Chart for Restricted Sequential Procedure Applied to Preferences.

trial so as to give the required entry rate of 150 pairs a year. Each patient was then allotted a survival time randomly chosen from the distributions represented by the two curves. The time at which the preference was obtained for each pair was then written on each card and the cards rearranged in order, according to this time. The preferences were then plotted on the sequential chart (Figure 4). The broken line shows the average direction we should expect our path to follow. The actual path shown by the zigzag line started off rather curiously owing to an unexpected excess of B preferences, but the A's caught up and eventually we hit the upper boundary at the 100th preference. Figure 2 shows that the preferences were coming in at very much the ex-

Table 3—Results of Life Table Analyses Carried Out at Stopping Point (1.15 Years from Start), and after Follow-Up (2.95 Years from Start)

6-Month Survival Rates:	True Value	Estimate After 1.15 Years	Estimate After 2.95 Years
A	0.71	0.682 ± 0.038	0.690 ± 0.033
B	0.51	0.506 ± 0.040	0.546 ± 0.035
Difference	0.20	$0.176 \pm 0.055 (t = 3.19)$	$0.144 \pm 0.049 (t = 2.94)$
1-Year Survival Rates:			
A	0.59	—	0.604 ± 0.036
B	0.35	—	0.328 ± 0.034
Difference	0.24		$0.276 \pm 0.049 (t = 5.61)$

pected rate. The 100th preference occurred at 1.15 years after the start of the trial, as compared with the expected 1.11 years. At this stage 174 pairs of patients had been entered into the trial and a life-table analysis was carried out for the results up to this stage. The results are shown in Figure 3, where the zigzag line shows the estimated survival rates. A comparison of the 6-month survival rates shows a highly significant difference, confirming the sequential verdict, and the estimated rates are consistent with the true values (see Table 3). The same 174 pairs were now followed until 3 years after the start of the trial (actually 2.95 years for convenience), and another life-table analysis was carried out. Again the differences in 6-month and 1-year rates are highly significant and are consistent with the true values.

REFERENCES

1. Feller, W. Statistical Aspects of ESP. J. Parapsychology 4:271–298, 1940.
2. Armitage, P. Sequential Tests in Prophylactic and Therapeutic Trials. Quart. J. Med. 23:255–274, 1954.
3. Bross, I. Sequential Medical Plans. Biometrics 8:188–205, 1952.
4. Armitage, P. Restricted Sequential Procedures. Biometrika, 44:9–26, 1957.
5. Wald, A. Sequential Analysis. New York: Wiley, 1947.
6. Snell, E. S. and Armitage, P. A Clinical Comparison of Diamorphine and Pholcoldeine As Cough Suppressants by a New Method of Sequential Analysis. Lancet i:860–862, 1957.
7. Armitage, P. The Comparison of Survival Curves. J. R. Statist. Soc., B. (In press.)

Dr. Armitage is on the staff of the Statistical Research Unit of the Medical Research Council, London School of Hygiene and Tropical Medicine, London, England. He was a visiting scientist at the National Institutes of Health, Bethesda, Maryland, 1957–1958.

This paper was presented before the Statistics Section of the American Public Health Association at the Eighty-Fifth Annual Meeting in Cleveland, Ohio, November 13, 1957.

Influenza Vaccination for Special Risk Groups

The Public Health Service has recommended consideration of influenza vaccination among groups wishing to guard against absenteeism in their professions or occupations, and among those to whom the disease might be an added health risk. Practicing physicians should be the judges of whether or not to vaccinate individuals. The special risk groups that should be the special area of consideration for vaccination include hospital staffs whose services are necessary to the care of the sick; groups of persons living in close proximity where influenza could spread rapidly, such as institutions, industrial or service groups, big or small, in occupations where the sudden absence of a sizable part of the force would create serious disruption of the work; and individual patients or groups who have a special risk, such as the aged, the chronically ill, and pregnant women.

There are now ample supplies of influenza vaccine of the polyvalent type, containing immunizing material against the important strains of influenza, including the Asian, according to Surgeon General Leroy E. Burney. Vaccination, a prudent measure for certain groups and individuals, should be planned before the fall season begins.

George Rosen, M.D., Editor
Berwyn F. Mattison, M.D., Managing Editor

Editorial Board

Granville W. Larimore, M.D., Chairman
Martha L. Clifford, M.D.; Howard W. Ennes, Jr., M.P.H.; John J. Hanlon, M.D.; Frank L. Horsfall, Jr., M.D.; Perry F. Prather, M.D.; The Editor and Managing Editor

Staff

Lydia Gari, Editorial Assistant; Elizabeth Kellogg, Editorial Assistant; Frances Toorock, Editorial Associate; Willimina Rayne Walsh, Associate Secretary

Journal of Public Health

EDITORIALS

Housing Conservation and Urban Renewal

The maintenance of minimum standards for decent, safe, and sanitary housing has long been recognized as a concern of government. The inadequacy of the housing supply has become an increasingly pressing problem in recent years. This has been particularly true since the Second World War, because the rate of new home construction has not kept pace with population growth and the formation of new families. The problem has three aspects. New housing is needed to keep up with population growth. Existing housing must be preserved and protected against deterioration. Where slums and blighted areas have developed they must be removed.

Endeavors to arrive at a satisfactory solution of the problem have produced a variety of governmental programs. Recognizing that new construction, both public and private, has not kept up with the expansion of population, authorities have turned with increasing interest to protection and conservation of the existing housing inventory. It has been recognized that, in addition to municipal redevelopment programs, salvage and rehabilitation activity can be undertaken with great success. Dwellings and neighborhoods can be preserved and the useful life of the housing inventory extended for many years.

Redevelopment, rehabilitation, and conservation must be based on a combination of planning, code enforcement and action by citizen groups. For the most part experience along these lines has been obtained largely from larger municipalities. Little attention has been given to such problems in smaller communities, suburban or rural areas.

For this reason one can heartily welcome the three-volume report, "Housing Codes—The Key to Housing Conservation," recently issued by the New York State Division of Housing. This report represents an auspicious milestone in the creation of technics to deal with the problems involved in a successful rehabilitation and conservation program. To facilitate the development of rehabilitation programs by New York communities, the Division of Housing in conjunction with the Urban Renewal Administration, developed a housing code and recommended methods of administration for adoption by these communities.

To be sure, it is not enough just to adopt a housing code. Citizen understanding and participation are also required. But a housing code can be successfully used to spark a program of rehabilitation for individual structures

as well as for whole neighborhoods. The New York State report provides an important tool, which together with effective leadership and assistance by state governments can create vigorous local programs to overcome the scourge and blight and slum which has befallen our communities. All health workers concerned with community planning and development would do well to study it.

The Importance of Learning to Crawl

MANY PROFESSORS who are remembered by their students have clichés which over the years they learn to use with considerable skill. A professor of obstetrics, back in medical school days, was no exception to the rule. Over and over again he hammered home the point that one must learn to crawl before one walked; learn to walk before one ran; and learn to run before one leaped. The number of his pupils who benefited from this maxim was highly significant. How many sound public health programs have come to naught or have died aborning because this axiom was ignored!

Perhaps that is why the exciting possibilities inherent in physical rehabilitation have not been realized. Instead of being aware of the lack of personnel resources and the relative poverty of many local health departments, those who justifiably believe that the crippled and disabled should be helped to walk again, were blinded by the very brilliance of their cause. They mistakenly assumed a sophistication on the part of local health departments which did not exist. As a result, only in the large cities have health departments been able to make any significant entry into the vast and fertile field of physical rehabilitation.

Now, belatedly, the leaders of this movement are starting anew, on their hands and knees, crawling—crawling in order to better prepare themselves for the walking that must be done. They are starting with a single, simple concept; a concept of improved paramedical services, particularly nursing services, for stroke patients.

This concept is understandable anywhere and everywhere. It is tangible and concrete. It can be implemented without the appropriation of large amounts of new money. It can be understood with relative ease by most public health workers in local communities. Physicians appreciate the value of these paramedical services offered by public health agencies for their private stroke patients. They see in them little threat to their own management of the case.

Once this single, simple application of basic physical rehabilitation principles has been mastered by local health departments, the task of expanding the contribution in terms of magnitude and complexity will not be hard. Once the crawling stage has been mastered, can the walking stage be far behind?

If this evolutionary approach to the intricate problem of applying the many technics already known about the rehabilitation of the physically handicapped is followed assiduously, the day will come when adequate facilities and services will be available all over America to help the lame and the halt to walk and the blind to see.

LETTER TO THE EDITOR

TO THE EDITOR:

In your worthy editorial on John Snow (June, page 776) you say, "The cause of the disease [cholera], how it is transmitted, and the means of prevention have been known for many years." You also say, "Thus the Egyptian epidemic did not spread to other countries, for within days after the discovery of the first cases some 20,000 million doses of vaccine had been dispatched to Cairo from a number of other countries, among them the United States, Great Britain, the Soviet Union, and India." It is implied, I think, or at least it might be inferred that the vaccine effectually controlled the outbreak. Should this not be questioned? Are there not far too many gaps and inconsistencies in the evidence of the efficacy of cholera vaccine to warrant such faith in it? The apparent acceptance of it seems to me to be in striking contrast to the timely—or even belated—questions regarding school health services that Dr. Leona Baumgartner raises in the pages immediately preceding the editorial.

N. E. MCKINNON, M.B.
Department of Epidemiology and Biometrics, School of Hygiene, University of Toronto, 150 College Street, Toronto.

June 27, 1958.

EDITOR'S NOTE:

There is no doubt that this is still a controversial subject. Reviewing the very voluminous literature on active immunization against cholera, Politzer * finds that "the various authors treating this subject fall into three groups—namely, those who come to the conclusion that this mode of vaccination is definitely useful for the prevention and control of cholera, those who express a directly opposite opinion, and finally a number of writers who, while not denying the value of the method, feel doubtful as to its actual importance in anti-epidemic work." There are good reasons which explain these different views. In first place, there seems to be a consensus that the immunity conferred is of short duration (four to six months), with maximal immunity being attained about the tenth day after immunization; the antigenic potency varies from one laboratory to another and some of the vaccines are below the vibrio content of 8,000 million which is considered to give satisfactory antigenic response. The optimum dosage (0.5 ml followed one week or ten days later by 1.0 ml) is not always observed and frequently only one dose is given. One can well imagine that if the above requirements are not strictly observed a number of failures should be expected. Besides, one cannot ignore the fact that under the environmental conditions prevailing in the countries where cholera is endemic, massive infections can occur, against which no vaccine could protect adequately. Still a number of reports of the application of cholera vaccine to military and civilian populations show conclusively varying degrees of protection (loc. cit.*).

The present situation regarding immunization can perhaps be summarized in Politzer's words (loc. cit.*) ". . . parenteral cholera immunization with killed vaccines, though far from being a panacea, is of great value for the prevention and control of manifestations of the disease." The statement—"far from being a panacea"—should be emphasized. The basic control of the disease continues to be a problem of environmental sanitation, with the vaccine an adjuvant factor.

The relative importance of the vaccine

* Politzer, R. Cholera Studies 11. Bull. WHO No. 17, 1957.

as a contributory factor in the prevention of the spread of cholera is further supported by the fact that more than half of the countries (including the U.S.A.) bound by the International Sanitary Regulations require vaccination certificates against cholera for travelers coming from infected areas. Furthermore, the International Sanitary Regulations state (Article 61) that while a traveler coming from an infected area may be placed in isolation for five days if he is not in possession of a valid vaccination certificate, he may be put under surveillance only (for the same period) if he has been vaccinated. The different procedures—isolation versus surveillance, depending on the vaccination status—recommended by the Expert Committee on International Quarantine, formed by leading experts on the subject, indicate that the vaccine is recognized as having a value within certain limits. It would appear, therefore, that doubt on the use of cholera vaccine does not seem justified.

Cardiovascular Disease Nursing

The University of Minnesota announces its fourth program in cardiovascular disease nursing, January 5–March 21, 1959. Given jointly by the Schools of Public Health and Nursing, this program is designed to offer nursing leaders in all areas of nursing an opportunity to gain a better understanding of new developments and skills in the cardiovascular field and to apply these developments in their present job situations. Enrollment will be limited to approximately 10 nurses, who will be selected primarily from supervisory, teaching, and consultant positions. A limited number of special federal traineeships are available.

Further information from School of Public Health, University of Minnesota, Minneapolis 14, Minn.

GUIDE FOR RESIDENCIES IN PUBLIC HEALTH

Formulated by the Residency Review Committee for Preventive Medicine; approved by the American Board of Preventive Medicine and the Council on Medical Education and Hospitals of the American Medical Association.

RESIDENCIES in preventive medicine are considered an integral part of the achievement of diplomate status as a specialist in public health by the American Board of Preventive Medicine. This certifying board has been established through the Council on Medical Education and Hospitals of the American Medical Association and the Advisory Board for Medical Specialists. The principles are outlined in the publication of the Council, "Essentials of Approved Residencies and Fellowships," published by the American Medical Association.

Responsibility for adequate residency training in preventive medicine for public health practice is shared by the Council on Medical Education and Hospitals, the Residency Review Committee for Preventive Medicine, and the American Board of Preventive Medicine. The responsibilities of each of these three agencies include:

Council on Medical Education and Hospitals:
- Approval of Specialty Boards
- Administration of Residency Training Program in Public Health
- Representation on Residency Review Committee for Preventive Medicine

Residency Review Committee for Preventive Medicine:
- Approval of training areas and programs
- Recommendation of training requirements and policy revisions

American Board of Preventive Medicine:
- Receive applications, conduct examinations, and certify individuals for Specialty Board recognition
- Establishment of training and educational requirements for board eligibility
- Representation on Residency Review Committee for Preventive Medicine.

NOTE: The Journal of the American Medical Association, October 4, 1958, will carry the list of approved residencies in public health. This will also be published in the November, 1958, issue of this Journal.

Eligibility Requirements

Specialty Board recognition of physicians in public health requires examination by the American Board of Preventive Medicine.

Eligibility to take the examination includes the following requirements:

1. Graduation from an approved medical school and completion of at least one year of a general rotating internship.

2. A period after internship of not less than six years of special training, teaching or practice in public health which must include (3), (4), and (5) following:

3. Successful completion of at least one academic year of approved graduate study leading to the degree of Master of Public Health or an equivalent degree or diploma; or training or study deemed by the board to be substantially equivalent to such graduate study. It is recommended that at least six months of residency field training precede the graduate study.

4. Two years of supervised field experience in an area currently approved by the Residency Review Committee. One of these two years, logically the second, may be satisfied by supervised experience gained in an approved area:
   a. Assistant to a full-time health officer; or
   b. Full-time health officer under close supervision by an official health agency; or
   c. Assistant to the director of a specialized public health program such as maternal-child health; or
   d. Resident in an AMA-approved clinical residency in a field directly related to public health practice, such as pediatrics, obstetrics.

5. Three years of full-time practice of public health or in the full-time teaching of public health in a university or an equivalent thereof acceptable to the board.

Agency Responsibility for Residency Program

Residency training in clinical specialities is usually provided by a specific

hospital. When such a hospital utilizes as a supplement the short-term services of affiliated institutions, the responsibility for such service, including continuing supervision of the resident as a part of the over-all residency training plan, is a function of the chief of service of the particular hospital seeking approval. In residency training for public health, the public health agency seeking approval is considered the counterpart of the hospital. Therefore, dependent on ability to satisfy resident training requirements, it is possible for a local department of health, a state department of health, or a federal health agency to be so approved. However, in each instance the major part of the period devoted to experience in public health practice should be concerned with local public health administration and programs.

Keeping in mind the desirability of providing the resident with the best type of training possible—particularly the quality and scope of training offered, the stability of program and supervising personnel, and the avoidance of preceptorship limitations—it would be the exception where a single local health agency independently could adequately satisfy desirable residency requirements without supplementary health services of other health agencies (state, other local, and so forth) to augment the over-all training program. The mechanics of satisfying this condition will depend on the health service organization pattern of the state or other health agency in which the residency will be carried on. In most instances the state health department should be the approved residency training agency for the state, and would be responsible to the approving authority for the training program, as well as for the acceptability of the local health agency facilities utilized and the continuing supervision of the resident. However, where a local health department wishes residency approval based on its ability to meet residency requirements, whether independently or with the assistance of supplementary services, the individual local health department is responsible directly to the Residency Review Committee for the training program and would be the agency considered for approval.

Approval of Training Areas

In general, state health departments are considered the most suitable type of health agency to provide adequate residency training. They are best able to assume responsibility for the direction and supervision of residency training within their respective states. Credit for residency training under the American Board of Preventive Medicine is limited to those areas approved by the Residency Review Committee for Preventive Medicine. A list of approved residencies is published annually in the Journal of the American Medical Association.

Application for Approval of Training Areas

A public health agency desiring consideration for approval of a residency training program in public health should make application to the Council on Medical Education and Hospitals of the American Medical Association, 535 North Dearborn Street, Chicago, Ill. The application and all supporting documents should be submitted in triplicate in order that a copy may be forwarded to members of the Residency Review Committee. The committee meets biannually.

In the event of a lapsed approval or a previous disapproval, the application will be considered on the same basis as an initial application. In the case of a disapproved agency, a reapplication may be submitted no earlier than a subsequent calendar year.

Initial Application

An initial application shall be in the form of a request for approval of a

residency in preventive medicine that can be applied toward certification in the specialty of public health, naming the agency requesting consideration for approval and transmitting the following supporting documents:

1. A full and detailed plan for residency training. This should include name and qualifications of the responsible training officer; description of the budget, personnel, and activities of the state and local health departments involved, as may be applicable; description of other agencies and facilities utilized and the pertinent arrangements.

2. A "Guide for Residency Training of Public Health Physicians," or comparable document, which essentially outlines the scope and content of the proposed residency program, including relevant teaching guides designed to promote an optimal learning experience on the part of the resident. A copy of such a guide, as developed by an approved agency, may be obtained from the secretary of the American Board of Preventive Medicine. However, its value is limited and it is only suggestive, since conditions vary between states.

Responsibilities of the Approved Agency

An approved agency is usually a state health department, but may in some instances be a local health department or some other agency or facility. An approved agency should:

1. Submit an annual reapplication for approval on January 1.

2. Select qualified residents.

3. Maintain for each resident a personal record on file covering the total period of required residency training, containing

   a. A record of assignments,
   b. The personal evaluation reports of those supervising the resident's training,
   c. The periodic and special assignment reports required of the trainee, and
   d. Such other significant information as may be necessary in rating the resident's total accomplishment at the end of his training.

4. Provide the resident with a statement or certificate, where warranted, signifying satisfactory completion of residency training requirements. A copy should be sent to the secretary of the American Board of Preventive Medicine.

5. Maintain and as may be necessary revise and improve (a) the basic plan for the residency and (b) the "Guide for Residency Training of Public Health Physicians." A copy of this guide should be furnished each resident upon acceptance.

6. Maintain the quality of the training program as approved by the council and notify the council and the resident when losses of personnel or other changes make the continuation of such quality impossible.

The purpose of the residency is to provide the best of practical instruction, observation, participation in the specialty of public health, and the assumption of gradually increasing responsibility in this specialty. The efforts of the staff shall be devoted to this end. Exploitation of a resident as a substitute for an unsupervised public health physician or otherwise will be considered a breach of faith.

Board requirements in public health include one academic year in an accredited school of public health leading to the degree of Master of Public Health or an equivalent training. At least six months of field residency training is strongly recommended before undertaking the academic training. Ideally, the first year should consist of six months of general orientation and six months of more specific training, with increasing responsibility in generalized public health practice, followed by the academic year.

The second year of supervised residency training in an approved area warrants assignments of greater responsibility. Where applicable, the resident may accept appointment as (1) assistant to a full-time approved health officer; or (2) full-time health officer of a relatively small population health jurisdiction under frequent and close guidance by the approved health agency; or (3) assistant to an approved director of a specialized public health program such as communicable disease, maternal and child health; or (4) resident in an AMA approved clinical residency in a field directly related to public health practice such as pediatrics, obstetrics.

So far as practicable, continuing close liaison with a nearby school of public health is desirable. Close cooperation should be maintained with departments of preventive medicine or similar departments of medical schools.

There should be an advisory committee on residency training composed of representatives of the state health department, local health departments, the teaching field of public health, the field of general education, and the voluntary health agencies. This committee should concern itself with the development, content, and improvement of the training plan, and with the policies and procedures used in effecting the program, inclusive of instructional technics and the periodic evaluation of all phases of the training given. A report with recommendations should be made periodically by the committee to the health agency head.

Provision should be made for technical advisory services in the various subspecialties of public health. Representatives of such services may function advantageously as a consultant and advisory staff and may give assistance in the training of the resident.

A specific unit of the health agency eligible for approval should be designated as directly responsible for the recruitment of residents and for the development, supervision, and proper functioning of the residency program throughout the full period of residency. The director of the residency training program unit should be a public health physician who shall give first priority in time and interest to the training program. He should be certified in public health by the American Board of Preventive Medicine or should possess comparable qualifications, and he shall have demonstrated ability and interest in teaching as well as ability to administer a comprehensive public health program.

Since the residency is a learning and training period, it is essential that so far as possible the activities and experiences be carefully developed on the basis of participation rather than observation and that the educational content of such participation be carefully and deliberately designed.

The residency must provide adequate contact, on a learning basis, of as broad a spectrum of public health and preventive medicine as possible. This should include urban and rural experiences, state and local health agency activities, and other public and voluntary health agency programs. It should in addition include occupational medicine and, where available, experience with a variety of patterns of the administration of organized medical care. Emphasis must be on local health programs. Recognition must also be given to the needs and interests of the resident.

The local health departments in which training is given should be well established and should serve an area large enough to offer comprehensive experience in the various aspects of a community health progam. While there may be some exceptions, it is unlikely that a community of less than 50,000 population would measure up to this requirement. The department should be efficiently organized on a basis which will assure an acceptable quality of work and close supervision of the resident's training. The program should include close working relationships with other agencies, official and voluntary, in the development and conduct of a community-wide health program.

Office and laboratory space should be adequate for efficient functioning. A basic collection of reference texts and periodicals in public health should be available. A comprehensive and efficiently kept system of records covering administrative, vital statistics, and work operations in the different areas of the program is necessary.

The resident's instruction should commence with suitable orientation to the training program and should contain a review of the experiences which will be provided and of the public health programs and services which he will observe and in which he will participate. He should be given a copy of "A Guide for the Residency Training of Public Health Physicians." Such a guide, based on local conditions, should be designed to permit a listing of significant activities and experiences to be undertaken by the resident in each of the various components of the three major aspects of public health practice: public health programs, public health services, and public health administration.

Utilizing this guide, the director of training may draw up a schedule of assignments, both required and elective, for each resident, which the resident will follow during the first year of training. This should assure the resident, the training director, and the instruction staff of adequate instruction, observation, participation, and limited responsibilities in all the basic phases of a well balanced local health services program provided the resident's training is adequately and continuously supervised by the training director.

Postdoctoral Study in Statistics

Awards for study in statistics by persons whose primary field is not statistics but one of the physical, biological, or social sciences to which statistics can be applied are offered by the Department of Statistics of the University of Chicago. Awards range from $3,600 to $5,000 on the basis of an 11-month residence. Final date for application for the academic year 1959–1960 is February 16, 1959. Further information from the Department of Statistics, Eckhart Hall, University of Chicago, Chicago 37, Ill.

ASSOCIATION NEWS

EIGHTY-SIXTH ANNUAL MEETING
AMERICAN PUBLIC HEALTH ASSOCIATION
ST. LOUIS, MO.—OCTOBER 27–31, 1958

Procedures for Adoption of Resolutions Changed

During the past several years, Association Resolutions Committees have recommended a tightening up of the procedure for adoption of resolutions, since resolutions in effect establish Association policy. The committees have felt that the rush of Annual Meeting affairs did not permit the careful consideration necessary to development of policy statements.

Hence, the Executive Board requested Mr. Morton, as president of the Association, to prepare recommendations for changes in the procedures. His recommendations will be presented by the Board to the Governing Council at St. Louis for possible adoption as future Association procedures.

Among the changes recommended are: Resolutions will be considered in two classifications: (1) Those dealing with policy, and (2) those that do not deal with policy. All resolutions of a policy nature must be received in the APHA office at least 60 days prior to the first day of the Annual Meeting. Shortly after the 60-day deadline the Resolutions Committee will meet and review all resolutions. Those that seem suitable for presentation to the Governing Council will be referred to interested committees, Sections, or other groups in the Association for comment, after which resolutions will be reworded and revised in the light of the comments.

As in the past, resolutions will also be received at the time of the Annual Meeting. Those of a nonpolicy nature will be considered by the Resolutions Committee for presentation to the Governing Council at the current Annual Meeting. Those of a policy nature will be held for the following Annual Meeting. As in the past there will be a public reading of all resolutions on Tuesday, October 28, at 2:30, Private Dining Room 7, Sheraton-Jefferson Hotel, before presentation to the Governing Council. Here there will be opportunity for interested members to comment. Sections in particular will be urged to have representatives present to indicate the views of the Sections.

At the time of reporting to the Governing Council the chairman of the Association Resolutions Committee will read in full all resolutions recommended for adoption and list by title those not so recommended together with a statement of the disposition made of the latter.

Mr. Morton has transmitted a copy of the proposed changes to each member of the Governing Council with the warning that the Council will be asked to take formal action during the St. Louis Meeting. Each Section is also following the proposed changes this year in order to give them a trial. Section secretaries have already agreed to the proposed revised procedures, as have the members of the Executive Board and several chairmen of recent Association Resolutions Committees.

NEWS OF AFFILIATED SOCIETIES AND BRANCHES

APHA AFFILIATED SOCIETIES AND BRANCHES

SOCIETY AND SECRETARY

ALABAMA PUBLIC HEALTH ASSOCIATION, Norma L. Chandler, State Health Dept., Montgomery
ARIZONA PUBLIC HEALTH ASSOCIATION, Mrs. Verona Massey, State Dept. of Health, Phoenix
ARKANSAS PUBLIC HEALTH ASSOCIATION, Mrs. Vada Russell, State Health Dept. Bldg., Little Rock
CALIFORNIA, NORTHERN, PUBLIC HEALTH ASSOCIATION, Mrs. Dalrie S. Lichtenstiger, 130 Hays St., San Francisco, Calif.
CALIFORNIA, SOUTHERN, PUBLIC HEALTH ASSOCIATION, Byron O. Mork, M.D., University of California at Los Angeles, Los Angeles
COLORADO PUBLIC HEALTH ASSOCIATION, Alice de Bruyn Kops, 4660 S. Delaware, Englewood, Colo.
CONNECTICUT PUBLIC HEALTH ASSOCIATION, E. Louise Ratcliff, M.P.H., Griffin Hospital, Derby
CUBAN PUBLIC HEALTH SOCIETY, Dr. Raphael Calvo Fonseca, Calle 19 No. 511 Altos Vedado, Havana
FLORIDA PUBLIC HEALTH ASSOCIATION, Nathan J. Schneider, Ph.D., P. O. Box 210, Jacksonville
GEORGIA PUBLIC HEALTH ASSOCIATION, Carl Fox, 33 Pryor St., N.E., Atlanta
IDAHO PUBLIC HEALTH ASSOCIATION, Wesley O. Young, D.M.D., P. O. Box 640, Boise
ILLINOIS PUBLIC HEALTH ASSOCIATION, William J. Hixon, Evanston Health Dept., Evanston
INDIANA PUBLIC HEALTH ASSOCIATION, Gale E. Coons, State Board of Health, Indianapolis
IOWA PUBLIC HEALTH ASSOCIATION, Mary L. Wombacher, State Dept. of Health, Des Moines
KANSAS PUBLIC HEALTH ASSOCIATION, Evelyn Ford, State Board of Health, State Office Bldg., Topeka
KENTUCKY PUBLIC HEALTH ASSOCIATION, Mrs. Rosalie Walters, 620 S. Third St., Louisville 2
LOUISIANA PUBLIC HEALTH ASSOCIATION, Andrew Hedmeg, M.D., State Dept. of Health, New Orleans 7
MASSACHUSETTS PUBLIC HEALTH ASSOCIATION, Mrs. Elizabeth K. Caso, Dept. of Health, Cambridge
MICHIGAN PUBLIC HEALTH ASSOCIATION, Maurice J. Mayer, 405 Hollister Bldg., Lansing
MINNESOTA PUBLIC HEALTH CONFERENCE, D. S. Fleming, M.D., State Dept. of Health, University Campus, Minneapolis
MISSISSIPPI PUBLIC HEALTH ASSOCIATION, H. E. Boone, P. O. Box 1700, Jackson
MISSOURI PUBLIC HEALTH ASSOCIATION, Mrs. Nadia Craver, 5th Fl., State Office Bldg., Jefferson City
MONTANA PUBLIC HEALTH ASSOCIATION, Elizabeth Bishop, M.D., P. O. Box 638, Hardin
NEBRASKA PUBLIC HEALTH ASSOCIATION, Orville D. DeFrain, Lincoln-Lancaster County Health Dept., Lincoln
NEW MEXICO PUBLIC HEALTH ASSOCIATION, Daniel T. Marley, P. O. Box 8066, Albuquerque
NEW YORK CITY, PUBLIC HEALTH ASSOCIATION OF, Allan Marlowe, 295 Flatbush Ave., Brooklyn 1
NEW YORK STATE PUBLIC HEALTH ASSOCIATION, Mrs. Kathleen Boland, State Dept. of Health, 84 Holland Ave., Albany
NORTH CAROLINA PUBLIC HEALTH ASSOCIATION, R. W. Brown, Bucombe County Health Dept., Asheville
NORTH DAKOTA PUBLIC HEALTH ASSOCIATION, Jean E. Norton, R.N., Box 133, Bismarck
OHIO PUBLIC HEALTH ASSOCIATION, Virginia Jones, Ohio Dept. of Health, Dayton
OKLAHOMA PUBLIC HEALTH ASSOCIATION, Marjorie Butler, 3400 North Eastern, Oklahoma City
OREGON PUBLIC HEALTH ASSOCIATION, Christie Corbett, R.N., State Board of Health, Portland
PENNSYLVANIA PUBLIC HEALTH ASSOCIATION, Emma J. Petach, R.N., 324 N. Second St., Harrisburg
PUERTO RICO PUBLIC HEALTH ASSOCIATION, Mrs. Luisa L. Trinidad, Santurce
SOUTH CAROLINA PUBLIC HEALTH ASSOCIATION, Mrs. Laura M. DeMarse, State Health Dept., Columbia
SOUTH DAKOTA PUBLIC HEALTH ASSOCIATION, Alice Brady, R.N., State Dept. of Health, Pierre
TENNESSEE PUBLIC HEALTH ASSOCIATION, C. B. Tucker, M.D., State Dept. of Health, 420 Sixth Ave., N., Nashville
TEXAS PUBLIC HEALTH ASSOCIATION, Wayne H. Garrett, City Hall, Fort Worth
UTAH PUBLIC HEALTH ASSOCIATION, Mrs. Virginia Cole, City Health Dept., 115 S. State St., Salt Lake City
VIRGINIA PUBLIC HEALTH ASSOCIATION, William A. Dorsey, P. O. Box 2088, Richmond
WASHINGTON STATE PUBLIC HEALTH ASSOCIATION, Jack E. Mathews, State Dept. of Health, Smith Tower, Seattle
WEST VIRGINIA PUBLIC HEALTH ASSOCIATION, Paul B. Shanks, State Health Dept., Charleston
WISCONSIN ASSOCIATION FOR PUBLIC HEALTH, Paul Weis, 1 W. Wilson St., Madison
SOUTHERN BRANCH, A.P.H.A., Betty Ficquett, State Board of Health, Columbia, S. C.
WESTERN BRANCH, A.P.H.A., Mrs. L. Amy Darter, State Dept. of Health, 2151 Berkeley Way, Berkeley, Calif.

Massachusetts Task Force Report

At the April 24 annual meeting of the Massachusetts Public Health Association the Lemuel Shattuck Award was presented to Edith Arthur Beckler of Cambridge in recognition of her distinguished service as a bacteriologist. Cited were her development of the State Bacteriological Laboratory as its first full-time bacteriologist, her inspiring teaching at Simmons College, and her work at the Associated Boards of Health laboratory in Wellesley. This was the first time the Shattuck award had gone to a laboratory worker.

At the same meeting the following officers were elected:

President: Franz Goldmann, M.D., former associate professor of medical care, Harvard School of Public Health

President-Elect: Dean A. Clark, M.D., general director, Massachusetts General Hospital

Vice-President: Leon Sternfeld, M.D., health commissioner, Cambridge

Recording Secretary: John G. McCormick, Brookline Health Department

Treasurer: Ann M. Thomson, head, Nursing

Section, Massachusetts Department of Public Health.

MPHA has had a Task Force for the past several months. Its charge was to examine the current status of MPHA critically and to make recommendations through which the association can more adequately meet its responsibility to public health in the state. It published a report in July, which has numerous recommendations on a variety of subjects: communication between executive committee and sections and membership; working committees for program areas; interorganizational relations, both state and APHA, particularly cooperative relationships; regionalization of activities; committee on personnel; educational meetings; legislation; finances; among others. Supplementing the report are a couple of statistical tables that tell a good deal about the history and activities of MPHA. The list of special projects dating back to 1947 is particularly interesting. The most recent project, sponsored by the Health Officers Section is a 1958 Survey of the Salaries of Public Health Workers in the state. Detailed reports of the 11 projects, 1947–1958, are assembled in a special notebook presumably available to MPHA members for examination and perhaps to others with a legitimate interest.

This report—and the public health conscience it represents—is a valuable document that might have interest for other affiliates. The executive secretary of the association, Mrs. Elizabeth K. Caso, Department of Health, Cambridge, Mass., will be glad to share the report with officers of other affiliates.

New York Emphasizes World Health

International health was high on the program of the 54th annual state health conference and seventh annual meeting of the New York State Health Association, attended by some 1,800 persons. At a general session, moderated by Henry van Zile Hyde, M.D., director, Division of International Health, Public Health Service, WHO regional director for Africa, Francisco J. C. Cambournac, M.D., named the fight against the great endemics as the area's number one problem, particularly malaria. An estimated 116 million persons live in malaria ridden areas. Yellow fever and smallpox are virtually under control but bilharziasis and trypanosomiasis remain important problems.

Speaking at this session also was Victor Zhdanov, M.D., vice minister of health, U.S.S.R. The combination of a developing economy, improvement in cultural and living standards, and the extensive health services, which came into being after the revolution, have led to a sharp improvement in demographic indexes. He paid particular tribute to Drs. Salk and Sabin "for their valuable advice and help which allowed (his country) to organize quickly for the production of polio vaccine." Also on the platform at this meeting was Sir Arcot Mudaliar, vice chancellor, University of Madras.

The APHA was represented at this meeting by its president, Roy J. Morton, C.E., who spoke at the first general session on "Expanding Scope and Concepts of Environmental Health." Here also Governor Averill Harriman said that providing adequate health insurance protection for older people was one of the great challenges to public health and medicine. Leo E. Gibson, M.D., president of the State Medical Society, pointed out the saving of lives through scientific research and treatment by the medical profession. "Along with the privilege of prolonging life the medical profession also has an obligation to see that the prolongation of life is a happy and not a sad occasion." Health Commissioner Herman E. Hilleboe presided at this session.

The Hermann M. Biggs award of the

NYSPHA was presented to Earl Devendorf, director, Bureau of Environmental Sanitation, and 40-year veteran of the State Health Department. In making the presentation Deputy Commissioner Granville E. Larimore, M.D., mentioned particularly Mr. Devendorf's ability and experience in water resources, his strong support of pollution abatement, and his service on many water resource and pollution control bodies.

The retiring president, Julius S. Prince, M.D., commissioner of the state department's Jamestown district office, in his presidential address reported a total of 1,300 members in the association and the organization of two new sections—nutrition and behavioral sciences. He also discussed the nature and responsibilities of a professional organization, particularly a multidiscipline one.

The newly elected officers are:

President: Meredith H. Thompson, Dr.Eng., assistant director, Bureau of Environmental Sanitation, New York State Department of Health

President-Elect: Walter C. Levy, M.D., M.P.H., assistant director, Local Health Services, New York State Department of Health

Vice-Presidents: V. J. Sallak, executive secretary, Buffalo and Erie County Tuberculosis Association; Marion L. Henry, director of business administration, New York State Department of Health

Treasurer: Eugene J. Cahalan, Albany

Secretary: Kathleen S. Boland, consultant in health education, New York State Department of Health

Representative to APHA Governing Council: Bosse B. Randle, R.N., director, Division of Public Health Nursing, Nassau County Department of Health.

Pennsylvania in a Four-Way Meeting

The Pennsylvania Public Health Association shared sponsorship of the seventh annual state health conference August 17–21 with the state's Health Department, Health Council, and Medical Society. The theme, "Public Health in a Changing Pennsylvania," was dealt with from various angles—in a first general session where addresses on "A Changing Public Health" were given by C. L. Wilbar, M.D., secretary of health, James A. Crabtree, M.D., dean of the Graduate School of Public Health, University of Pittsburgh, and Ruth B. Freeman, D.Ed., associate professor of public health administration, Johns Hopkins School of Hygiene and Public Health. Dr. Wilbar noted that "we have not yet put into effect anywhere near the increased time and effort we should be giving to application of present-day knowledges as to how to control the chronic diseases." Dr. Crabtree in reviewing the last decade noted that on the average one new area of responsibility a year had been added to the state's public health program—areas such as air pollution, alcoholism, cleft palate, public health, civil defense, professional training, and environmental safety. But "we have hardly gotten off the ground in many respects," particularly with relation to the many problems that will shortly need to be dealt with on a metropolitan basis quite apart from county lines.

Roy J. Morton, C.E., president, represented the APHA and spoke at the luncheon session where there was a panel discussion on "Where Does the PPHA Go from Here?" At this time, Thomas Parran, M.D., retiring dean of the Pittsburgh School of Public Health, was presented with PPHA's Award of Merit in recognition of his "leadership in the advancement of public health knowledge and training and for devoted public service to Pennsylvania, the nation, and the world." Ira E. Foutz, public relations consultant, Pennsylvania Tuberculosis and Health Society, was made an honorary member, PPHA, in appreciation of a "lifetime of dedication to the promotion of public health in Pennsylvania."

Two 90-minute morning and one evening session were devoted to curbstone conferences on 15 different subjects.

Problems in communicable disease control were dealt with in all three sessions; glaucoma and public health education in two.

Multiple screening tests were provided those attending through the cooperation of the State Tuberculosis Society, the Nurses Association, the Association of Clinical Laboratories, and the Nutrition, Chronic Disease, and Public Health Nursing Divisions of the State Health Department.

Program chairman was Henry R. O'Brien, M.D., director, Division of Professional Training; general chairman was Robert H. Conn, M.P.H., chief, Community Health Section, each of the State Health Department. Mary Beam, R.N., assistant professor, University of Pennsylvania School of Nursing, was the retiring president. New officers as follows were elected:

President: P. Walton Purdom, M.S.S.E., director of environmental health, Philadelphia Department of Health

President-Elect: Robert H. Conn, M.P.H.

Vice-President: Anna DePlanter Bowes, M.D., director, Division of Nutrition, Pennsylvania Department of Health

Secretary-Treasurer: Emma J. Petach, R.N., executive secretary, Tuberculosis and Health Society, Dauphin and Perry Counties.

1970 Grand Valley Million Persons

The Colorado Public Health Association meeting in Grand Junction in May, heard Dr. Tell Ertl and John Pownall of the Union Oil Company prophesy that by 1970 Grand Valley (Garfield County and environs) would be the Pittsburgh of the West with more than a million population and all types of industry. And, says the CPHA news bulletin, "the public health implications of this rapid growth were clearly written on the wall." The prophey was part of a descriptive color slide presentation of the oil shale industry spanning more than five million years and indicating its great future potential.

At a luncheon meeting Robert Dyar, M.D., director of preventive medicine, California Department of Health, reported on plans and activities of the Western Branch which will meet with CPHA in Denver in 1960. He reported on the imminent establishment of APHA's regional office in San Francisco and the increased service thus possible to the Western Branch and affiliates. Dr. Dyar also reported on his recent observation of health problems in Germany. He found a lack of such preventive measures as immunization and prenatal care, the use of social workers in place of public health nurses, a clinging to traditional practices, and a lack of research. He reported housing as the number one problem because of its effect on sanitation, tuberculosis, and neuroses.

At the luncheon also Ella Avery Mead, M.D., of Greeley, who recently retired after 50 years of practice in Weld County, received the annual Dr. Florence Sabin Award given to a person outside the immediate field of public health who has made an outstanding contribution to the public health program of the state and community.

Included in the program was a panel on disaster preparedness using a break in Barker Dam as the projected disaster. Preventive medicine, welfare, public health nursing, and sanitation were represented on the panel. Other symposia dealt with planning and action for maintaining health in the 1970s, with migrant labor, and with the rural health activities of the State Medical Society that back up health department programs.

The membership of CPHA numbers nearly 500; attendance at the recent meeting was 200. The outgoing president, Margaret Beaver, M.D., director, Mesa County Department of Public Health, was succeeded by Margaret D. Lewis, R.N., director, Visiting Nurse Association, Denver. Other officers are:

President-Elect: Roy Cleere, M.D., state health commissioner

Vice-President: Glen Paul, Greeley
Secretary: Alice Kops, Englewood
Treasurer: Merle H. Ross, state representative, National Foundation
Representative to APHA Governing Council: J. Robert Cameron, M.P.H., director, Urban Renewal Authority, City and County of Denver.

Ohio Group Calls on the Governor

The Ohio Public Health Association, at its meeting in Columbus in May, adopted two resolutions relating to the state's public health services. One urged that appropriations for health services be maintained at the present level at least. Proposed budget cuts in the State Health Department and their baleful effect upon quantity and quality of services had been detailed by Health Commissioner Ralph E. Dwork in the opening address of the meeting. The second resolution called for increasing the commissioner's salary to $20,000 annually. Following the meeting a three-man committee met with Governor O'Neill in a half hour conference. According to the OPHA Newsgram "the delegation was well received and felt less alarmed about the proposed cuts" after the talk.

The membership of OPHA was reported as nearly 600 in eight sections. The attendance at the meeting was over 400, about 90 per cent of whom were members. The Ohio association is divided into four regional districts with membership ranging from 100 to 175. A membership committee with the help of a leaflet, "Speak Up for Public Health" brought in nearly 100 new members during the year.

The May meeting created a Publications Committee with responsibility for the Newsgram and other information and publicity material. Its chairman is John Morrison of Columbus. Further attention to making public health known was in a general session led by Warren Guthrie of the Cleveland News. Here the panel urged more active public relations and more emphasis on newer public health problems. Also at this meeting, Anne Burns, R.N., director, Division of Nursing, State Health Department, reported on the 10th anniversary session of WHO, which she attended by appointment of President Eisenhower, as representative of United States nurses at the World Health Assembly.

James Warfield of the State Health Department was the retiring president. Newly elected officers are:

President: Earl Long, director of laboratories, Akron Health Department
Vice-Presidents: T. A. Gardner, M.D., M.P.H., health officer, Southwest District, Ohio Department of Health, Dayton; Catherine E. Ludlow, R.N., supervisor, Bureau of Public Health Nursing, Cincinnati Board of Health
Secretary-Treasurer: Virginia H. Jones, nutrition consultant, Southwest District, Ohio Department of Health
Representative to APHA Governing Council: George H. Eagle, M.P.H., director, General Sanitation, Ohio Department of Health.

APHA membership application blank on page XXXIII

EMPLOYMENT SERVICE

Annual Meeting Employment Service

An employment center will be located in the Scientific Exhibit area at the 86th Annual Meeting. See the official program and directional signs at the Meeting for exact location. The service will be sponsored by the Missouri State Employment Service and the Association. Professional personnel will be available to assist employers and employees. Vocational counseling will also be available. Binders containing copies of applications and position descriptions will be available for inspection by applicants and employers.

Employers and candidates are urged to file beforehand. This should be done through either your local state employment service office or the Association. The required forms will be available at both places. Filing by October 8 is necessary if records are to be forwarded to the Meeting. It will be possible to register at the Meeting also.

A conference room will be available at the center for use by employers and applicants. Early registration will facilitate appointment arrangements.

The following pages present information for those seeking public health personnel and for those seeking positions in public health. Other information concerning vacancies and personnel available is on file in the Association office. Anyone wishing to have the benefit of this additional information can obtain it by writing to the Vocational Counseling and Placement Service of the Association.

Advertising space in these pages is available at special rates for the use of employers or individuals. The charges are $5 for the first 50 words or fraction thereof and $1 for each additional 10 words or fraction thereof. There is no charge to members or Fellows of the Association who desire to utilize the **Positions Wanted** portion of these pages. **Closing date** for receipt of advertisements is the first of the month preceding the desired month of publication. **All correspondence should be sent to the American Public Health Association, 1790 Broadway, New York 19, N. Y.**

POSITIONS AVAILABLE

Residency in Public Health—Two-year, Board-approved residency in well established health department in California. Salary $755 per month; maximum age 35 years; California license required. Apply **Box PH-81**, Employment Service, APHA.

Psychiatrist—Requires medical degree with specialty in psychiatry. Salary $13,104. Position with State Health Department, Denver, Colo. Write to Dalton Roberts, Chief, Administrative Services, Colorado State Department of Public Health, 420 State Office Bldg., Denver 2, Colo.

Psychiatrists—Federal government retirement plan, insurance, annual and sick leave provisions. No restriction on part-time practice during hours outside of regular work time. (1) **Chief, Child Guidance Clinic**—Director of a treatment-oriented facility comprised of two psychiatrists, two psychologists, two psychiatric social workers. Must be Board eligible; two years' specialized training in child psychiatry required. Salary $11,595 per annum, plus contract for special project leadership in exceptionally bright children with emotional problems for additional $3,600 per annum for three years. (2) **Chief of Community Mental Health Clinic**—for northeast Washington. To conduct a varied program in clinic to be established utilizing psychiatrist, psychologist, social worker. Emphasis on community mental health; clinical work with children and adults. Must be Board certified. (3) **Staff Psychiatrist**—Legal psychiatric services, providing diagnostic and consultative services to law enforcement agencies of the District of Columbia. Work on a staff composed of three psychiatrists, two clinical psychologists, and two psychiatric social workers. Must be Board eligible. Salary $10,130 per annum. Write Director, District of Columbia, Department of Public Health, 300 Indiana Ave., N.W., Washington 1, D. C., Attention: Marvin E. Perkins, M.D.

Public Health Physicians—for overseas employment. Salary range $9,000–$15,000, plus housing and other allowances where applicable. Minimum qualifications are formal training or experience in public health, preferably both for top-level positions. Assignments will be for a minimum of two years. Write Public Health Division, Box 100, International Cooperation Administration, Washington 25, D. C.

Wanted: **Health Officers**—for local units in Florida—**Health Officer IV,** $11,040–$13,800; **Health Officer III,** $10,080–$12,600; **Health Officer II,** $9,120–$11,520; **Health Officer I,** $7,200–$9,120. Each applicant is rated on a basis of experience and training. Good state retirement plus Social Security, Merit System protection, travel allowance 10 cents per mile, 40-hour week, work in vacation surroundings. Apply to Wilson T. Sowder, M.D., State Health Officer, P. O. Box 210, Jacksonville 1, Fla.

The Idaho Department of Health offers outstanding opportunities for qualified **Public Health Physicians**—Four established and operating district health departments need full-time qualified medical directors. Positions are under State Merit System; entrance salaries are $935–$1,090 per month depending on qualifications. Idaho has a lot to offer: a growing program, plenty of fresh air with no smog, good year-round climate, easy access to best fishing and hunting in the West. Address inquiries to Dr. Terrell O. Carver, Administrator of Health, Statehouse, Boise, Idaho.

Medical Health Officer—for established rural county health department in central Illinois. Good personnel policies with vacation and retirement. Salary range $9,600–$12,000 for physician with public health training and experience. Contact W. T. Douglas, M.D., Hillsboro, Ill.

Public Health Physician—for established bicounty health department in southern Illinois—possibility of expansion. Good personnel policies, vacation, sick leave, Social Security benefits. Salary range $928–$1,134 monthly for physician meeting Illinois requirements. Contact George J. Meshew, M.D., 107A Oak St., Mounds, Ill.

Associate Medical Director—in Chicago office of the Division of Services for Crippled Children, which is a unit of the University of Illinois. Administrative responsibilities in directing the State Crippled Children's Program in 11 counties surrounding Chicago, Ill. Joint appointment on faculty of the College of Medicine available for part-time teaching, research, or clinical activity. Good retirement system. Experience and training in pediatrics or public health desirable. Eligibility for licensure in Illinois required. Salary open, subject to qualifications of the applicant. Apply to Herbert R. Kobes, M.D., Director, Division of Services for Crippled Children, 1105 S. Sixth St., Springfield, Ill.

Public Health Physician—Director of Public Health in Portland, Me., community of 80,000 and center of metropolitan area of about 150,000. Department staff of 37 engaged in progressive public health program, including active housing inspection and enforcement of minimum housing standards and environmental sanitation. Council-manager form of government since 1923. Health department enjoys excellent relationships with private and voluntary agencies, and a real civic interest in public health matters exists. Health department budget for 1958 totals $155,307. Portland offers an unparalleled opportunity for pleasant living. A seacoast city, yet it is within easy driving distance of mountains, lakes, rivers, and forests, which provide excellent year-round recreational facilities. All of the cultural, educational, and recreational centers of New England are within two hours' flying time or a day's drive. An up-to-date public school system offers excellent elementary and secondary educational advantages. Degrees in medicine and public health required. Salary $11,537–$13,937, retirement, vacation, sick leave, group life insurance. Travel expense for local travel and attendance at professional conferences provided. Write Julian H. Orr, City Manager, City Hall, Portland, Me.

Medical Health Officer—for a two-county area in the Upper Peninsula of Michigan. Good personnel policies and vacation. Salary range $13,500–$15,000, according to qualifications and experience. Total population of area 56,000. Counties border on Lake Michigan. For further information write to Delta Menominee District Health Department, Webster Annex, Escanaba, Mich.

Child Psychiatrist—Interested in academic career with opportunity to conduct a mental hygiene clinic for preschool children. Academic title and research opportunity with excellent salary. Three years' accredited residency in psychiatry, and at least two years' postresidence experience with one year minimum in child psychiatry. Apply Dr. S. Mouchly Small, School of Medicine, University of Buffalo, Buffalo 14, N. Y.

Senior Industrial Hygiene Physicians—$8,750–$10,520. Two vacancies in New York City office of the New York State Department of Labor. Civil service examination on December 13, 1958, open to qualified United States citizens. Requires possession of or eligibility for New York State medical license; graduation from approved medical school and completion of satisfactory internship; one year full-time practice as physician. In addition, candidates must have either (a) one year full-time industrial medical practice; or (b) completion of postgraduate course in public health (including a course in industrial hygiene) or industrial medicine, of one academic year in residence approved by New York State Public Health Council; or (c) one year full-time medical research experience in industrial employment conditions or industrial health hazards. For further details and application write to Recruitment Unit, Box 7, New York State Department of Civil Service, State Campus, Albany 1, N. Y.

District Health Officers, Wisconsin—Two positions. Headquarters Rhinelander and

Fond du Lac. M.P.H. degree and eligibility for license to practice medicine in Wisconsin required. Salary $10,464–$14,484, commensurate with experience. Write E. H. Jorris, M.D., Assistant State Health Officer, 400 State Office Bldg., Madison 2, Wis.

Director, Local Health Services, Wisconsin—Work with the state health officer and professional staff in improvement of local health services. M.P.H. degree and eligibility for license to practice medicine in Wisconsin required. Salary $10,464–$14,484, commensurate with experience. Write E. H. Jorris, M.D., Assistant State Health Officer, 400 State Office Bldg., Madison 2, Wis.

Public Health Nurses—Immediate openings in county health department, generalized nursing program. Will consider graduate nurses who have had public health nursing experience. Must have California driver's license. Salary range: **Public Health Nurses,** $351–$439; **Junior Public Health Nurses,** $314–$392. Apply to Charles W. Folsom, M.D., M.P.H., Health Officer, Tulare County Health Department, P. O. Box 110, Visalia, Calif.

Public Health Nurses—Opening for **Public Health Nurse II.** B.S. degree, plus one year experience in established health department. Salary range $360 per month to $450 per month, plus liberal travel allowance. **Nurses** without experience and with degrees and public health training can qualify as Public Health Nurse II after one year employment. Write to J. H. White, M.D., Director, Weld County Health Department, P. O. Box 521, Greeley, Colo.

Public Health Nurse—for a municipal health department, to do both field work and teaching. Car allowance. Salary $4,813–$5,540 per year. For application and further information write to Department of Personnel, City Hall, Dearborn, Mich.

Public Health Nurses—Beginning salary $4,440. **Graduate Nurses**—Beginning salary $4,020. Five-day work week from 8:30 a.m. to 4:30 p.m. Four weeks' vacation, 11 holidays, 12 days' sick leave annually. Pension plan. Generalized public health nursing agency founded by Lillian D. Wald. Ongoing inservice education program. Four universities offer opportunities for study at all levels. Some scholarship assistance available. For information, write or call Personnel Office, Visiting Nurse Service of New York, 107 East 70th St., New York 21, N. Y. Telephone Lehigh 5–1100.

Biostatisticians—Positions available with the New York State Department of Health. Duties require a high degree of independent judgment in the application of the principles of biostatistics to studies in the field of public health. Minimum qualifications: Bachelor's degree with 15 credit hours in statistics and mathematics, with at least six credit hours in statistics and experience in statistical work in a public health agency. Graduate training in biostatistics and public health desirable. Appointments may be made at three salary levels, depending upon training and experience: $4,770–$5,860, **Biostatistician;** $5,840–$7,130, **Senior Biostatistician;** $7,500–$9,090, **Associate Biostatistician.** Liberal vacation, retirement, sick leave, health insurance plan, and Social Security. For further information, write Mr. Sylvester J. Bower, Acting Director of Personnel, New York State Department of Health, Albany, N. Y.

Director, Bureau of Health Education—for city-county health department, serving population of 630,000. M.P.H. and two years' experience in health education required. Salary $6,444–$7,836. Write George A. Denison, M.D., Health Officer, Box 2591, Birmingham, Ala.

Public Health Educator II—Initiate and develop school-community health education programs. Desirable qualifications: Formal training and experience in public health; sound working knowledge of principles of education and methods of teaching. Salary $5,424–$6,504 per year. Travel allowance, vacation, sick leave, retirement benefits, group insurance plans. Write Dr. Amy L. Hunter, Director, Bureau of Maternal and Child Health, Wisconsin State Board of Health, Madison 2, Wis.

Engineer—for position in Sanitation Division of the Maricopa County (Phoenix) Health Department. Assistant to the director of sanitation. Salary range $527–$641. Degree in engineering and several years' experience in public health work. Apply Arizona Merit System, 11 N. 17th Ave., Phoenix, Ariz.

Sanitary Engineers—for overseas employment. Salary range $8,000–$13,000, plus housing and other allowances where applicable. Qualifications include degree in sanitary engineering or public health for subordinate positions, plus appropriate experience for greater responsibility. Assignments will be for a minimum of two years. Write Public Health Division, Box 100, International Cooperation Administration, Washington 25, D. C.

Psychiatric Social Worker—Requires master's degree with psychiatric sequence. Salary $442–$572. Position with state health department. Write to Dalton Roberts, Chief, Administrative Services, Colorado Department of Public Health, 420 State Office Bldg., Denver 2, Colo.

Regional Nutritionist—to carry out a generalized program of consultative services to county health units. Minimum requirements are a bachelor's degree, approved die-

tetic internship, and two years' experience in public health or a related field. Current salary range is $4,800–$6,000, plus good travel allowance, state retirement, and Social Security. Apply to Marjorie M. Morrison, Florida State Board of Health, P. O. Box 210, Jacksonville 1, Fla.

Virologist—State Virus Laboratory. Master's degree with virus training and two years' experience. Salary $440–$550. Entrance step dependent on qualifications. Excellent opportunity in diagnostic and research activities in newly established and well equipped laboratory. State Board of Health, Helena, Mont.

Medical Health Officer—for Jefferson County Health Department (population 105,000). Offices in Golden, Colo., site of Colorado School of Mines. This unit has a well trained staff of nurses and sanitarians. Qualifications require an M.P.H. and experience in the field of public health. Salary starts at $11,772. Address inquiries to Dalton Roberts, Chief, Administrative Services, Colorado State Department of Public Health, 420 State Office Bldg., Denver 2, Colo.

Health Statistician—to render consultant services in programs and projects of the Pan American Sanitary Bureau, Regional Office of the World Health Organization, with assignment to a Latin-American country and travel to neighboring countries. Requirements: Professional degree, M.D., Ph.D., or equivalent in public health, with specialization and experience in health statistics. Attractive salary and allowances. For further details write to Personnel Officer, PASB/WHO, 1501 New Hampshire Ave., N.W., Washington 6, D. C.

Speech Therapist—to direct Crippled Children Commission speech program. Requirements: Master's in speech pathology, three years' experience as a speech therapist, one of which must have been in a supervisory capacity, and basic speech certificate from the American Speech and Hearing Association. Headquarters Louisville. Beginning salary $504 per month. Reimbursement for travel expenses. Apply Merit System Director, Kentucky State Department of Health, 620 S. Third St., Louisville, Ky.

Technical Director of Blood Bank and Serology Section—of large laboratory in connection with 1,000-bed general hospital affiliated with two schools of medicine. Person with a master's degree or with a bachelor's degree and equivalent experience can qualify. Pay range is $5,304–$6,444 per year. Three weeks' vacation; eleven paid holidays. Applicants must be United States citizens. Department of Personnel, City of St. Louis, 235 Municipal Courts Bldg., 14th and Market, St. Louis 3, Mo.

Public Health Physician—to succeed health director who plans to retire in a year or two, or when assistant is qualified. Urban community in north central Illinois. Attractive position. Endowed health department. No politics. No rural driving. Good salary. Usual allowances and benefits. Write Arlington Ailes, M.D., M.P.H., Director, Hygienic Institute for LaSalle, Peru, and Oglesby, LaSalle, Ill.

POSITIONS WANTED

On Box Numbers, Address APHA at 1790 Broadway, New York 19, N. Y.

Public Health Engineer—B.S., civil engineering; one and one-fourth years graduate study. Seven years' experience in local health department; nine years regional sanitary engineer; two and one-half years assistant director, division of local health organization. Desires position as director of local environmental sanitation program or in state health department. **Box E-39,** Employment Service, APHA.

Public Health Administrator—Male, age 45. LL.B. degree; 19 years' experience in public health administration. Will accept either foreign or domestic appointment. Write **Box C-40,** Employment Service, APHA.

Public Health Physician—M.S.P.H., eight years' full-time health officer experience and extensive experience in school work. Available for administrative, school, or deputy health officer position January 1, after retiring from federal service. Health excellent. Rocky Mountain or Southwestern states preferred. No travel. **Box PH-86,** Employment Service, APHA.

Bacteriologist—45. Nine years' medical laboratory and research, five years' public health laboratory, three years' field experience and epidemiological research with international organization, and extensive experience in diagnostic bacteriology, serology, sanitary bacteriology, and parasitology. Desire position in medical or public health laboratory in foreign countries under American auspices. Will accept assignment for minimum of two years. Available February, 1959. **Box L-65,** Employment Service, APHA.

Health Officer or Epidemiologist—Age 34, M.D., M.P.H., Diplomate of American Board of Preventive Medicine (P.H.). Five years' civilian, two year's military, experience and training, clinical and administrative in public health. Special knowledge of psychiatry, tuberculosis, venereal diseases, and acute CD. Progressive program and salary important. E. W. Minard, M.D., 6303 Rosena Ave., San Bernardino, Calif.

Commercial Advertisements

All communications on the following commercial advertisements should be sent to Burneice Larson, Medical Bureau, Suite 605, 900 North Michigan Avenue, Chicago 11, Ill.

OPPORTUNITIES AVAILABLE

(a) Public health director; residential suburb, 75,000; university, four colleges, modern council-manager form of city government widely known for its progressive methods of providing municipal services to its citizens; Midwest. (b) County health officer; preferably one well qualified in public relations; $1,000–$1,200; California. (c) Resident in public health; approved course; $8,400, official travel. (d) Sanitarian; degree in sanitary sciences, public health, or engineering, three years' experience required; foreign operations, major industrial company; $955. (e) Industrial hygienist; preferably with B.S. degree, chemistry major; one year graduate study in industrial hygiene with basic training in epidemiology and biostatistics, industrial health, environmental physiology and industrial toxicology; foreign appointment, $1,150 per month. (f) Health educator; considerable travel through two counties; headquarters in university city of 400,000; East. (g) Public health staff nurses and instructors; Latin America, Africa, Middle East; $5,000–$14,000. (h) Executive director, VNA; commuting distance, New York City; $6,000. (i) Public health nursing instructor; collegiate school; southern medical center; $6,400–$10,000. (j) School nurse; town of 150,000 near Chicago; $4,200 to $7,200.

OPPORTUNITIES WANTED

Wanted—Opportunities for public health physicians, nurses, health educators, engineers, laboratory personnel. Candidates in all parts of the country, available for administrative, academic and staff appointments. Negotiations strictly confidential.

—PENNSYLVANIA DEPARTMENT OF HEALTH—

Public Health Opportunities in Pennsylvania

REGIONAL MEDICAL DIRECTOR—$13,301–$16,978

Public Health Physician II—To develop and administer a comprehensive program of public health services in a region of several counties. Requirements: Five years of responsible experience in public health administration; eligibility for certification by the American Board of Preventive Medicine and Public Health; eligibility for licensure in Pennsylvania.

CHIEF, SECTION OF EPIDEMIOLOGY OF TRAFFIC SAFETY—$12,675–$15,387

Public Health Physician I (Epidemiology)—In the Division of Addictive Diseases (Behavioral Problems) to develop and administer a state-wide program on the epidemiology of traffic accidents and to coordinate such a program with other interested agencies and groups. Requirements: Four years of professional training and experience in public health, including completion of the formal training requirements for the appropriate medical specialty board; eligibility for licensure in Pennsylvania.

CHIEF, SCHOOL HEALTH SECTION—$12,675–$15,387

Public Health Physician I (Pediatrics)—In the Division of Maternal and Child Health, to coordinate and administer a state-wide public health program for children of school age. Requirements: Four years of training and experience in pediatrics, including completion of the formal training requirements for certification by the American Board of Pediatrics; eligibility for licensure in Pennsylvania.

CHIEF, CANCER CONTROL SECTION—$12,675–$15,387

Public Health Physician I (Cancer)—In the Division of Chronic Diseases, to develop and administer a state-wide program of cancer control. Requirements: Four years of professional training and experience, including completion of the formal training requirements for certification by the appropriate medical specialty board; eligibility for licensure in Pennsylvania.

CHIEF, HEART AND METABOLIC DISEASES SECTION—$12,675–$15,387

Public Health Physician I (Heart and Metabolic Diseases)—In the Division of Chronic Diseases, to develop and administer a state-wide public health program in the field of heart and metabolic diseases. Requirements: Four years of professional training and experience, including completion of the formal training requirements for certification by the appropriate medical specialty board; eligibility for licensure in Pennsylvania.

Environmental Sanitation

DIRECTOR—$9,011–$11,050

Sanitarian VI—Directs and executes Pennsylvania's environmental sanitation program in the fields of food sanitation, camps and schools, vector control, and individual water supplies and sewerage disposal facilities. Requirements: Graduation from a four-year college or university with major course work in sanitary or public health engineering, sanitary science or fields closely related to environmental sanitation, supplemented by graduate work in public health, public health engineering or sanitary science, to the level of a master's degree; and six years' experience in public health in a supervisory or administrative capacity.

All positions under the merit system; real opportunity for professional training and advancement; excellent retirement system; liberal sick leave, vacation and holiday benefits. Comparable education and training may be substituted for the stipulated requirements for these positions.

For further information or applications, please contact Dr. C. Earl Albrecht, Deputy Secretary of Health, P. O. Box No. 90, Harrisburg, Pa.

—PENNSYLVANIA DEPARTMENT OF HEALTH—

Public Health Opportunities in Pennsylvania

Public Health Nursing

ASSISTANT DIRECTOR OF NURSING—$7,407–$9,454

Public Health Nurse IV—Assists in administering a state-wide public health nursing program. Requirements: Graduation from a four-year college or university with major course work in nursing, including or supplemented by completion of an approved program of study in public health nursing, supplemented by graduate study in public health nursing, public health nursing education or public health to the level of a master's degree; and four years of public health nursing experience in a generalized public health program.

Industrial Hygiene

CHIEF, OCCUPATIONAL HEALTH SECTION—$12,675–$15,387

Public Health Physician I—(Occupational Health)—To coordinate and promote a state-wide program of occupational health. Requirements: Four years of professional training and experience in public health or occupational health, including completion of the formal training requirements for certification by the appropriate medical specialty board.

Tuberculosis Sanatoria

PHYSICIANS—$7,055–$9,011

Tuberculosis Physician I—Performs professional medical work of general duty character in the medical care and treatment of tuberculosis patients and employees in a State Tuberculosis Hospital. Requirements: Graduation from an accredited school of medicine and the completion of a regular rotating internship in an approved hospital, with the degree of Doctor of Medicine, and two years of experience in the practice of medicine, including one year in the diagnosis and treatment of pulmonary and chest diseases.

Division of Medical Civil Defense

DIRECTOR—$9,011–$11,501

Civil Defense Medical Coordinator—Develops and coordinates a state-wide plan for the operation of civil defense medical and health services. Requirements: Graduation from an accredited school of medicine supplemented by completion of a regular rotating internship in an approved hospital with the degree of Doctor of Medicine and five years' experience in the general practice of medicine, including one year in a responsible administrative position as an armed forces medical officer or as a public health officer in a generalized public health program.

All positions under the merit system; real opportunity for professional training and advancement; excellent retirement system; liberal sick leave, vacation and holiday benefits. Comparable education and training may be substituted for the stipulated requirements for these positions.

For further information or applications, please contact Dr. C. Earl Albrecht, Deputy Secretary of Health, P. O. Box No. 90, Harrisburg, Pa.

BOOKS AND REPORTS

All reviews are prepared on invitation. Unsolicited reviews cannot be accepted.

ORTHOPSYCHIATRY AND THE SCHOOL—Edited by Morris Krugman. New York: American Orthopsychiatric Association (1790 Broadway), 1958. 265 pp. Price, $4.30.

The publication of this volume is further recognition of the fact that maintenance and promotion of mental health are not the sole concern of the psychiatric professions but rather a responsibility of many allied and related professions, agencies, and institutions. It is recognition, too, of the importance of the role of our schools in promoting good mental health.

The material for this book was gathered from papers read and symposia held at annual meetings of the American Orthopsychiatric Association and articles submitted to the Association's journal. The 26 selections are arranged into five sections: (1) Orthopsychiatry's Help to Education; (2) Orthopsychiatry and Problems of Learning; (3) Orthopsychiatry and School Mental Health; (4) Teacher Education in Mental Health; (5) Orthopsychiatry and Adolescent Problems.

The topics presented cover a wide variety of school mental health interests. Included are descriptions of programs, projects, and experiments ranging from those undertaken with preschool and kindergarten children to those involving adolescents and young adults at the college and university level.

They deal with such subjects as diagnosis and therapy, preventive measures, and the organization and operation of school mental health services. Frequent discussion of the roles and relationships of school personnel and members of the psychiatric disciplines should help point the way to closer and more effective working relationships between these groups.

The reader who may be seeking clear-cut answers to some of the unresolved questions in this area of mental health effort will find instead that there can be no single solution to complex problems. However, the diversity of approaches and points of view presented suggest that clinicians and educators alike will find this a highly valuable book, one that can be read and studied with profit. PHILIP WEXLER

RECENT STUDIES ON THE EPIDEMIOLOGY OF HISTOPLASMOSIS—By Michael L. Furcolow. Annals of the New York Academy of Sciences, Vol. 72, Art. 3, pp. 127–164. New York: New York Academy of Sciences (2 East 63rd Street), 1958.

Incredibly rapid advances have been made during the last 10 years in delineating many of the factors in the epidemiology of histoplasmosis. The author of this paper has made a number of important contributions in this field. In the present work he offers observations from his own investigations, and to a lesser extent from other studies, that bear on three important epidemiologic problems: (1) the cause or explanation of the observed geographic variation in the prevalence of histoplasmin sensitivity; (2) the means by which the fungus is disseminated in nature; and (3) the mode of transmission of infection to human beings.

For the first of these problems the author presents a number of theories formulated by himself and by others. He has studied temperature and humidity, freezing and thawing patterns of soil, type of vegetation, and wind patterns, among others. He has labored mightily, but has failed to produce convincing evidence, and has occasionally contradicted himself. It is hardly likely that the geographic pattern of histoplasmin sensitivity will finally be ex-

plained by such relatively simple factors as temperature and humidity alone, as the author suggests.

As for the other two problems, the data presented, which are for the most part not new, do not take into account some already established observations that have advanced the knowledge of the epidemiology of histoplasmosis beyond the point considered here. For example, there is considerable speculation over the possible role of fowl in the dissemination of the fungus, even though it has been shown by others that fowl do not harbor the organism, presumably because their body temperature is too high to support its growth. There are contradictions in some of the discussions, and many will take issue with the interpretation of some of the data, and the conclusions drawn from them. In a few instances, comparative data which do not stand up under significance tests are treated as though the differences were real. Since much of the paper is in the nature of a review, citations of earlier, original work might have been in order.

L. D. ZEIDBERG

VOLUNTARY HEALTH INSURANCE IN TWO CITIES. A Survey of Subscriber-Households —By Odin W. Anderson and the staff of the National Opinion Research Center. Cambridge, Mass.: Harvard University Press, 1957. 145 pp. Price, $5.00.

This is the report of a study of the cost of personal health services to families and the extent to which existing voluntary health insurance paid for such services. The study dealt with families covered by Blue Cross and Blue Shield plans in Birmingham and Boston and by the Aetna Life Insurance Company in Boston. The book complements an earlier study, "Family Medical Costs and Voluntary Health Insurance: A Nationwide Survey."

Among the many interesting findings are data indicating that the number of families incurring heavy costs for out-of-hospital medical services such as home and office calls and for dental care was greater than the number incurring heavy costs for surgery or for obstetrics. The report thus casts serious doubt on the assumption that voluntary health insurance plans need concern themselves only with coverage for hospital care and in-hospital physicians' services. There is also an interesting section on the attitudes of subscribers toward their existing benefits, and the extent to which they are willing to pay for expanded coverage.

It is noteworthy that some expansion of coverage has definitely occurred since 1953, when the data for this report were collected. At that time about thirty-five million Americans had insurance coverage for out-of-hospital medical expenses. By 1957 this figure had approximately doubled.

Some expected features are missing from this book. The absence of an index proved slightly inconvenient. Also absent is any reference to interviewing methods. The data were based on interviews with families, and although one may infer that methodology was comparable with the earlier Nationwide Study, it would be of interest to have some discussion of the way in which information was elicited and the accuracy of respondents' statements. However, the lack of these items does not seriously impair the value of this book.

All persons concerned directly or indirectly with health insurance plans should read this volume. It provides clear, well documented evidence that the voluntary health insurance movement has come far, but that it still has far to go before covering a major portion of the costs of personal health services in this country. PETER ROGATZ

BOOKS RECEIVED

Listing in this column acknowledges the receipt of books and our appreciation to the senders. Space and the interests of readers will permit review of some, but not all, of the books listed.

ADMINISTRATIVE MEDICINE—TRANSACTIONS OF THE FIFTH CONFERENCE OCTOBER 29–31, 1956. Edited by George S. Stevenson. New York: Josiah Macy, Jr. Foundation, 1957. 197 pp. Price, $3.75.

ADVANCES IN VETERINARY SCIENCE. VOL. 4. C. A. Brandly and E. L. Jungherr. New York: Academic Press, 1958. 414 pp. Price, $12.00.

ANNUAL EPIDEMIOLOGICAL AND VITAL STATISTICS—1955. World Health Organization. New York: Columbia University Press, 1958. 699 pp. Price, $12.00.

BACTERIAL AND MYCOTIC INFECTIONS OF MAN. Edited by Rene J. Dubos. Philadelphia, Pa.: Lippincott, 1958. 820 pp. Price, $8.50.

CURRENT MEDICAL RESEARCH. A reprint of the articles in the Report of the Medical Research Council for the year 1956–1957. London, England: Her Majesty's Stationery Office, 1958. 54 pp. Price, 3s.6d.Net.

DOCTOR SQUIBB. Lawrence G. Blochman. New York: Simon and Schuster, 1958. 371 pp. Price, $5.00.

ELEMENTARY TEACHERS GUIDE TO FREE CURRICULUM MATERIALS (15th ANNUAL EDITION). Randolph, Wis.: Educators Progress Service, 1958. 318 pp. Price, $6.50.

THE GANG—A STUDY IN ADOLESCENT BEHAVIOR. Herbert A. Bloch and Arthur Niederhoffer. New York: Philosophical Library, 1958. 231 pp. Price, $6.00.

PERSONNEL PROGRAM GUIDE FOR NURSING EDUCATION AND NURSING SERVICE AGENCIES. Ruth V. Johnston. Philadelphia, Pa.: Saunders, 1958. 137 pp. Price, $2.75.

PHYSICIANS' PRIVATE OFFICES AT HOSPITALS. STUDY AND REPORT SEPTEMBER, 1958. Philadelphia, Pa.: Hospital Council of Philadelphia, 1958. Price, $2.00.

PHYSIOLOGY OF PREMATURITY. TRANSACTIONS OF THE SECOND CONFERENCE MARCH 25–27, 1957. Jonathan T. Lanman. New York: Josiah Macy, Jr. Foundation, 1958. 160 pp. Price, $3.75.

READINGS IN MEDICAL CARE. Edited by the Committee on Medical Care Teaching of the Association of Teachers of Preventive Medicine, Chapel Hill, N. C.: University of North Carolina Press, 1958. 708 pp. Price, $6.50.

RECOMMENDED METHODS FOR THE ANALYSIS OF TRADE EFFLUENTS. Prepared by a Joint Committee of the Association of British Chemical Manufacturers and The Society for Analytical Chemistry. Cambridge, England: Heffer & Sons Ltd., 1958. 124 pp.

RECOMMENDED METHODS FOR THE MICROBIOLOGICAL EXAMINATION OF FOODS. Subcommittee on Methods for the Microbiological Examination of Foods. Harry E. Goresline, Chairman. New York: American Public Health Association, 1958. 212 pp. Price, $4.50.

REVOLVING DOOR—A STUDY OF THE CHRONIC POLICE CASE INEBRIATE. David J. Pittman and C. Wayne Gordon. Glencoe, Ill.: Free Press, 1958. 154 pp. Price, $4.00.

THE RUDOLPH MATAS HISTORY OF MEDICINE IN LOUISIANA. Edited by John Duffy. Baton Rouge, La.: Louisiana State University Press, 1958. 522 pp. Price, $10.00.

SELECTED STUDIES OF MIGRATION SINCE WORLD WAR II. PROCEEDINGS OF THE 34TH ANNUAL CONFERENCE, OCTOBER 30-31, 1957. New York: Milbank Memorial Fund, 1958. 244 pp. Price, $1.00.

TRANSPORTATION OF THE INJURED. Carl B. Young, Jr. Springfield, Ill.: Thomas, 1958. 238 pp. Price, $6.75.

VERDICT FOR THE DOCTOR. THE CASE OF BENJAMIN RUSH. Winthrop and Frances Neilson. New York: Hastings House, 1958. 245 pp. Price, $4.50.

VITAL STATISTICS OF THE UNITED STATES 1956. VOL. II—MORTALITY DATA. U. S. Department of Health, Education, and Welfare. Washington, D. C.: Gov. Ptg. Office, 1958. 525 pp. Price, $4.25.

YOUR BUDGIE'S HEALTH BOOK. Cessa Feyerabend. Fond Du Lac, Wis.: All-Pets Books, 1957. 128 pp. Price, $3.00.

A SELECTED PUBLIC HEALTH BIBLIOGRAPHY WITH ANNOTATIONS

Raymond S. Patterson, Ph.D., F.A.P.H.A.

Quoting the Writers—That venturesome (British) publication, the Health Education Journal, has embarked upon a digest which appears twice each year as a substitute for the parent journal for the particular month of issue. Those of us who have any concern with public health literature will want to see the latest number of the Health Information Digest, if only to sample its unique presentation: a running series of quotations from papers and reports selected to present an indication of current trends of thought and practice. This issue is chiefly occupied with mental health as an administrative function.

ANON. Mental Health. Health Information Digest (Health Education Journal) 3, 2:78 (July), 1958.

Which Comes First?—Discussing the processes of chosing activities that should have priorities and trying to put them in order of rank, the author of this stimulating paper says that we must first have knowledge based on fact and experience; we must analyze relationships; and we must exercise judgment in their interpretation if—at the end of the day or year—we are to be satisfied that what was left undone was less important than what we did. You'll like this all too short paper.

ARNSTEIN, M. G. Priorities in Public Health Nursing. Pub. Health Rep. 73, 7:577 (July), 1958.

Assistantes Sociales, et al.—This firsthand running account of what one British doctor saw during a comparatively recent inspection of French public health practices should prove of interest to all who have any curiosity whatever about the ways other countries tackle the same sort of problems that we face.

COOKSON, J. S. The Public Health Services in France. Public Health 72, 5:179 (Aug.), 1958.

For the Record—During outbreaks of poliomyelitis nearly a quarter million inhabitants of the Congo (both sexes and all ages) were orally vaccinated with a live, attenuated, strain of Type 1 poliovirus. Some received Type 3 virus, too. No sickness followed, and after vaccination no more cases of paralytic poliomyelitis were reported.

COURTOIS, G., et al. Preliminary Report on Mass Vaccination of Man with Live Attenuated Poliomyelitis Virus in the Belgian Congo and Ruanda-Urundi. Brit. M. J. 5090:187 (July 26), 1958.

Drinking Water Safeguards—Some of us who are not engineers may need to understand the difference between back-flow and back-siphonage, which decidedly are not one and the same. The sanitary hazards are quite dissimilar and their prevention calls for different safeguards. This article clarifies these matters in a way that the nonengineering mind can comprehend.

DILLON, W. M. Back-Flow in Plant Water Lines: Cause—Effect—Prevention. Modern San. 10, 7:19 (July), 1958.

Lo the Poor Bat—That most universally disliked (and by timid females, feared) of all small animals, the bat, having recently been accused of transmitting rabies, must now also bear the onus of contributing to the spread of histoplasmosis. The author of this latest accusation says that Histoplasma should be sought in the soil surrounding old

buildings infested by bats in those communities where histoplasmin-sensitivity is observed and is not readily explained by old chicken coops.

EMMONS, C. H. Association of Bats with Histoplasmosis. Pub. Health Rep. 73, 7:590 (July), 1958.

All About EEE—Nearly two-thirds of all reported human cases of eastern equine encephalitis have occurred in Massachusetts, so a field station for the study of the ecology of the disease was set up there. From it comes this observation that the crow, and certain other wild birds, seem to be the reservior for the infections in man and horse and that the chief vector is the mosquito, C. melanura. The story of this particular bit of research is interestingly told.

FEEMSTER, R. F., et al. Field and Laboratory Studies on Equine Encephalitis. New England J. Med. 259, 3:107 (July 17), 1958.

In England Now—For a new and illuminating picture of the present-day medical and hospital services in England, and public health's contribution to the national health program, this paper is earnestly commended to you. The paper's brevity precludes any possibility of its living up to the promise of its inclusive title.

GODBER, G. E. Health Services, Past, Present and Future. Lancet 7036, 1 (July 5), 1958.

AA, et al.—What's being done these days about alcoholism? This review article, presented with dramatic effect, incidentally, briefly tells what the variety of public and private agencies are undertaking in matters of research and prevention.

GOLIN, M. Robber of Five Million Brains. J.A.M.A. 167, 12:1496 (July 19), 1958.

Boot-Strap Reducing—This is an informal report on some applied research in the use of the discussion group as a method of inducing adolescent girls to reduce. The objectives of the study were not only the usual ones—methods of achieving weight loss and holding the line—but they sought also to show whether public health nurses were equipped to lead such overweight groups. You may be interested in the findings of this study even though your job is miles away from this area of public health concern.

HARMON, A. R., et al. Slender, Safe, Secure (two papers). Nursing Outlook 6, 8:452 (Aug.), 1958.

Challenging Postulates—Viewing mental health and mental illness as poles of the same continuum tends to impede progress in our understanding, says this author who postulates two separate groupings with polarities of (a) mental health vs. mental injury and (b) susceptibility to mental illness vs. mental illness. Radically different educational, therapeutic, and follow-up procedures are indicated for each group, he adds. Don't be satisfied with this inadequate statement of his thesis.

KORNER, I. J. Mental Health vs. Mental Illness. Ment. Hyg. 42, 3:315 (July), 1958.

Healthy Higher-Ups—Comparison of a group of business executives and a comparable group of nonexecutive employees revealed the unexpected finding that hypertension and other cardiovascular conditions were not more numerous in the executive group. Speculation on the possible implications of these findings can become an indoor sport in which any reader can indulge. One inference might be that success in a career goes hand in hand with emotional health. What do you think?

LEE, R. E., AND SCHNEIDER, R. F. Hypertension and Arteriosclerosis in Executive and Nonexecutive Personnel. J.A.M.A. 167, 12:1447 (July 19), 1958.

Mental Health Movies—How much do educational films help their viewers to understand principles and problems of health—with, or without, group dis-

cussion? Despite optimism concerning the probable effectiveness of films and group discussions little research has been attempted until recently to measure their effect. Findings reported here should be of general interest.

McGinnies, E. The Role of Mental Health Films in Community Discussion Groups. Ment. Hyg. 42, 3:409 (July), 1958.

Whose Sewage Is Best?—A prolonged drought forced this city to decide to drink its own (recycled) sewage. Obviously this is an esthetic and emotional problem of considerable horsepower, even though the city had, for many years, been drinking (without harm) the sewage of other cities up stream. Health people will be particularly interested in the discussion of the question posed in the heading above.

Metzler, D. F., et al. Emergency Use of Reclaimed Water for Potable Purposes. J. Am. Water Works A. 50, 8:1021 (Aug.), 1958.

Spreading the Nurse Thinner—What can practical nurses do best in the broad field of public health? Many of us have a stake in the solution of this problem of realigment of nursing functions in the face of personnel shortages. If you are one so concerned, then this report on what nurses are doing in 10 combination public health nursing services should prove of immediate usefulness. These nursing assistants are doing a lot now and might do more.

Pollack, A. The Practical Nurse in the Combination Agency. Nursing Outlook 6, 8:448 (Aug.), 1958.

Poor-Farm Substitute—Described in useful detail is this (British) plan for boarding out homeless and elderly patients under the oversight of community public health nurses and social workers. "A boarding-out scheme must be developed gradually, as this is a new venture to meet human need," comment the authors.

Roberts, G. N., and Hughes, T. W. A Boarding-Out Scheme for the Elderly. M. Officer 100, 3:53 (July 18), 1958.

If additional information is desired regarding the articles listed in this bibliography, please communicate directly with the publications in which they appeared; the addresses are furnished for your convenience.

Brit. M. J. (British Medical Journal), British Medical Association House, 19 Tavistock Sq., London W.C.1, England.

Health Ed. J. (Health Education Journal), Tavistock House, Tavistock Sq., London W.C.1, England.

J.A.M.A. (Journal of the American Medical Association), 535 N. Dearborn St., Chicago, Ill.

J. Am. Water Works A. (Journal of the American Water Works Association), 2 Park Ave., New York 16, N. Y.

Lancet, 7 Adam St., Adelphi, London W.C.2, England.

M. Officer (Medical Officer), Chronicle House, 72–78 Fleet St., London E.C.4, England.

Ment. Hyg. (Mental Hygiene), National Association for Mental Health, 372–374 Broadway, Albany 7, N. Y.

Modern San. (Modern Sanitation), Power Magazines, Inc., 855 Avenue of the Americas, New York 1, N. Y.

New England J. Med. (New England Journal of Medicine), Massachusetts Medical Society, 8 The Fenway, Boston 15, Mass.

Nursing Outlook, American Journal of Nursing Company, 2 Park Ave., New York 16, N. Y.

Pub. Health Rep. (Public Health Reports), Gov. Ptg. Office, Washington 25, D. C.

NEWS FROM THE FIELD

WHO News

Meeting World Dental Needs

Teams of auxiliary personnel headed by dentists is the solution for relieving the universal shortage of dentists, according to a special WHO Expert Committee meeting in Geneva in July, 1958. Such teams, it was suggested, could be employed with advantage both in areas with established programs and in building up services in those where little or no dental care is available.

Among auxiliary personnel to be trained are chairside assistants, dental technicians, dental hygienists, and school dental nurses. Training and employment of these needs are to be graduated according to the requirements of a given area.

Background material for the committee's work included a survey of ratio of qualified dentists to population in a group of 20 countries. The ratio ranged from one dentist to fewer than 2,000 persons in Sweden, Germany, Austria, and the United States, one for 270,000 in Indonesia and one for 60,000 in Malaya. In eight of the countries one dentist per 2,000–3,000 persons was reported. In none of the countries is the number of dentists keeping up with the growth of population. By 1975, for example, United States dentists will have to serve an average of 200 more persons than is now the case.

Shailer Peterson, D.D.S., secretary, Council on Dental Education, American Dental Association, was rapporteur for the meeting of the Expert Committee.

First Decade of WHO Newsletter

World Health, the Newsletter of WHO celebrated the end of its first decade with a special issue (Sept.–Oct.). Here are included 11 pages of pictures and supporting text of "Safeguarding the Health of 8 Million People." It is a good bird's-eye view of the services presided over by Health Commissioner Leona Baumgartner, M.D., and the related hospital, welfare, and mental health commissioners. The objective of the services are a happy family, according to Dr. Baumgartner, who advises newer countries to avoid our mistakes, particularly through decentralization rather than intensive urban development.

Another side of the health picture is told in "A Country Doctor Recounts the End of an Epoch"—this the story of a doctor in a French village. Division of Public Information, WHO, Palais de Nations, Geneva.

24th New England Health Institute

The nearly 800 New Englanders who attended the 24th New England Health Institute at the University of Connecticut June 18–20 were greeted by Governor Abraham A. Ribicoff. Among the chief subjects discussed were the aging population, radiation hazards, air pollution, chronic disease, especially in children, and accident prevention. Halbert L. Dunn, M.D., chief of the National Office of Vital Statistics dealt with aging in "Maturity as a National Asset." An entire special session was devoted to radiation with papers from Connecticut, the Public Health Service, the Atomic Energy Commission, and the Harvard Medical School. In addition, a dental public health session discussed occupational radiation exposure in Connecticut's dental offices.

"Public Health and the Practicing Physician" was the subject of a half-day special session in which an epidemiologist, a practicing physician, a sociologist, and a local health officer each spoke from his perspective.

A laboratory workshop on streptococci

and staphylococci led by Elaine Updyke, Sc.D., of the Communicable Disease Center, and limited to 40 persons was held in two, two-hour morning sessions and two, three-hour afternoon sessions.

The Connecticut State Health Department which was host to the institute analyzes the attendance in the July 7 issue of the department's weekly health bulletin. One fourth of those registered were nurses and slightly over 10 per cent were office workers. Physicians, environmental health personnel, and laboratory personnel followed but fewer than 10 per cent in each case.

Spanish Sanitary Engineering Terms

At the Sixth (biennial) Congress of AIDIS (Inter-American Association of Sanitary Engineers) decided to produce a Spanish edition of a glossary of terms used in sanitary engineering that will have universal acceptance in Spanish-speaking countries. A Spanish glossary from the basic English edition has already been prepared by Professor Paz Maroto of Madrid. AIDIS will compare this with engineering terms in use in Latin American countries and expand it to make it useful in these countries as well.

AIDIS is a nongovernmental organization that has been in official relation with WHO since the first meeting of WHO's Executive Board in 1948.

Palo Alto Medical Research Foundation

The new building of the Palo Alto Medical Research Foundation was dedicated on May 17, the first completed unit of Palo Alto-Stanford Medical Center now being developed. The dedication address was made by J. R. Heller, Jr., M.D., director, National Cancer Institute, who discussed the Foundation's role in research programs supported by the Public Health Service. Other items on the day's program was a Conference on Hematology and a program on "Studies on Tissue Transplantation."

The 10-year old Foundation was established by the members of the Palo Alto Medical Clinic. It is described as an "independent, nonprofit institution affording facilities for fundamental and clinic medical research to doctors wishing to undertake special investigations suggested by their practice." Its executive head is Russell V. A. Lee, M.D., who is also president of the Foundation's board.

The new building, costing more than half a million dollars was made possible through a Public Health Service grant and matching gifts from private donors. The building consists of 30 laboratories, a library with space for 20,000 volumes, and administrative offices.

Parkinson's Disease Foundation

The Parkinson's Disease Foundation has recently been established to develop research into the cause and cure of Parkinson's disease and related disorders, through research grants to investigators in this field. H. Houstin Merritt, M.D., is chairman of the Research Advisory Board and Melvin D. Yahr, M.D., is medical director. Application blanks for grants should be requested from and returned to the medical director, 125 E. 50th St., New York 22.

A Leadership Laboratory

A first Leadership for Organizational Effectiveness Laboratory is being held November 30–December 10 at Buck Hill Falls, Pa., under the leadership of the National Training Laboratories. It is intended primarily for professional staff members of national organizations with a volunteer constituency. The "Laboratory Method" of teaching basic social concepts as developed in the earlier Bethel and other conferences.

A folder that gives short, one-paragraph answers to what, who, why, where, when, how, and cost is available from NTL, which is a section of the Division of Adult Education Service, National Education Association, 1201 16th Street, N.W., Washington 6, D. C.

DuPont Employment of Handicapped

A study at the E. I. duPont de Nemours Company in Wilmington, Del., reports that the great majority of the more than 1,000 severely handicapped employees among their 90,000 across the country have achieved average-or-better levels of job performance, safety, and attendance. The 1,021 employees meet the severe standard of definition, "a physically handicapped condition which might prevent an employee from handling such jobs as the average non-impaired worker could handle." Thus many with lesser handicaps were excluded from the study.

Of the group studied only 2 per cent were below average in safety records, only 13 per cent in job performance, and only 14 per cent in attendance. For each item one half or more were above average. This record is made, it is reported, without creating jobs specially suited to handicapped persons. There is, however, skillful supervision which "can result in the upgrading of job potential for handicapped workers who might otherwise not enjoy opportunities for advancement."

Challenge of Perinatal Casualties

Cooperating in an "Institute on Perinatal Casualties—A Challenge to MCH and CC Programs" are the schools of public health of the Universities of Michigan and Minnesota. Sponsored also by the MCH and CC agencies of the two states with the help of the Children's Bureau, the Institute will be held in Minneapolis, December 8-12, 1958.

Each of the 11 states of Regions V and VI of the Children's Bureau (HEW) may select two staff members each from the MCH and CC programs to attend the institute. Selected on a multidiscipline basis, those proposed should be persons in key positions in program planning and administration, in consultation, and in supervision in the state. They should be selected by the MCH and CC directors.

Expenses for those attending will be paid by the University of Minnesota School of Public Health with funds provided by the Children's Bureau.

Further information and final program from:

Region V—Dr. Donald C. Smith, associate professor of maternal and child health, University of Michigan School of Public Health, Ann Arbor

Region VI—Dr. Helen M. Wallace, professor of maternal and child health, University of Minnesota School of Public Health, Minneapolis.

New Jersey Administrative Reassignments

The New Jersey State Health Department has had some administrative reorganization and reassignments, as announced by Daniel Bergsma, M.D., state health commissioner. The Bureau of Adult and Occupational Health has been abolished and its air sanitation, occupational health, and radiological health programs have been transferred to the Division of Environmental Health. Miriam Sachs, M.D., director of the abolished bureau has been assigned as health officer of the Metropolitan Health District with offices in Newark. William J. Dougherty, M.D., has moved from Newark to the directorship of the Division of Preventable Diseases succeeding the late Carl E. Weigele, M.D.

A Division of Special Consultation Services has been created with Ralph T. Fisher, former assistant director, Division of Local Health Services, as its di-

rector. Health education, nutrition, public health nursing, and certain research programs are assigned to this division. The tuberculosis control program has been transferred from the Division of Chronic Diseases to the Division of Preventable Diseases.

Among other reassignments are Geoffrey W. Esty, M.D., transferred as district health officer, Central State District, Trenton, from directing the Division of Constructive Health. This latter has been temporarily put in charge of Curtis F. Culp who continues as coordinator, Crippled Children Service.

Workshop for Israel Medical School

Heading a 12-member group of leaders in medical practice and education which participated in a special workshop in August at the medical school of the Hebrew University in Jerusalem was Harry M. Zimmerman, M.D., chief of the Laboratory Division of Montefiore Hospital in New York City. The sole purpose of the workshop was to advise and consult with the dean and faculty of the Hebrew University-Hadassah Medical School and the director general of the Hadassah Medical Organization, which is a partner in support of the school, on pressing problems in medical education and policy that demand immediate solution. Some of these problems are postgraduate education, preventive medicine and public health, exchange residency programs between Israel and the United States, research grants, and fellowships.

Those making up the workshop besides Dr. Zimmerman are:

Morris Greenberg, M.D., director, Bureau of Preventable Diseases, New York City Department of Health

Milton Helpern, M.D., chief medical examiner, New York City

Horace L. Hodes, M.D., director, Department of Pediatrics, Mount Sinai Hospital, New York City

Louis Leiter, chief, Medical Division, Montefiore Hospital

Samuel Z. Levine, pediatrician-in-chief, New York Hospital

Henry B. Makover, M.D., professor of preventive and environmental medicine, Albert Einstein College of Medicine

J. H. Quastel, professor of biochemistry, McGill University, and director, Research Institute, Montreal General Hospital

Ephraim Racker, M.D., chief, Division of Nutrition and Physiology, Public Health Research Institute, New York City

Eugene Rosenfeld, M.D., consultant to Hadassah for the Hadassah-Hebrew University Medical Center

George A. Silver, M.D., chief, Division of Social Medicine, Montefiore Hospital

William H. Stein, M.D., professor of biochemistry, Rockefeller Institute for Medical Research.

Studying Health and Welfare Plans

The relatively new Foundation on Employee Health, Medical Care, and Welfare (A.J.P.H. Sept., 1956, p. 1248) is making a series of studies and reports on health and welfare. The first, of which three parts in two volumes have been issued, is entitled "Problems and Solutions of Health and Welfare Programs." Improving Value and Reducing Costs, Part A, appearing in a single volume, outlines the benefits that can be purchased from insurance companies.

Parts B and C make up the second volume and deal respectively with benefits that are available under service plans, and how to compare service and indemnity benefits. The last part of this study, in a separate volume, will be on the advantages and disadvantages of self-insurance in health and welfare programs.

Subsequent studies will deal with patterns of medical care in International Association of Machinists' collectively bargained health and welfare plans. This one, already under way, is being conducted by the Columbia University School of Public Health. Others will deal with preventive medicine in such

programs, with dental care, with administrative procedures, accounting standards, actuarial implications, legal aspects, and responsibilities of unions and employers in the administration of the programs.

Foundation on Employee Health, Medical Care, and Welfare, 477 Madison Avenue, New York 22. Part A, 35 cents, Parts B and C; $1.

A New Group on Care of the Aged

The Joint Council to Improve the Health Care of the Aged was recently organized by four national organizations—the American Dental Association, the American Hospital Association, the American Medical Association, and the American Home Nursing Association. Its objectives as announced are to:

> "(1) identify and analyze the health needs; (2) appraise available health resources; and (3) to develop programs to foster the best possible health care regardless of economic status."

Offices have been set up at 139 N. Clark St., Chicago. Interim secretary was Edwin L. Crosby, M.D., director of the American Hospital Association. He has now been succeeded by Howard I. Wells, Jr., former executive secretary of the American Association for Maternal and Infant Health.

New National Tuberculosis Officers

Mario Fischer, M.D., health officer of Duluth, Minn., and the Duluth district of the State Health Department, took office as president of the National Tuberculosis Association at its 54th annual meeting in Philadelphia in May. At the meeting, attended by 2,500, H. McLeod Riggins, M.D., associate clinical professor of medicine, Columbia University College of Physicians and Surgeons, was named president-elect.

Meeting at the same time were the American Trudeau Society and the National Conference of Tuberculosis Workers. Daniel E. Jenkins, M.D., professor of medicine, Baylor University College of Medicine, took office as president of the former and Roger Mitchell, M.D., director, Colorado Foundation for Research in Tuberculosis, was named president-elect. The two identical officers for NCTW are L. L. Taylor, executive director, Stark County (Ohio) Tuberculosis and Health Association, and Alfred E. Kessler, executive secretary of the Marion County (Ind.) Tuberculosis Association.

20 Organized Counties in New York

Monroe County is the 20th of the 57 upstate counties in New York to organize a county health department including its contained cities. Heretofore the city of Rochester had its full-time health department while the rest of the county received limited service from a district office of the State Health Department. Thus a population of nearly 200,000 was added as of September to those receiving organized locally operated health services.

By a 1946 revision of the Public Health Law, county health departments receive state aid for 75 per cent of the first $100,000 and 50 per cent of expenditures above that amount. Fourteen of the 20 counties have been organized since that date.

The Air Over Louisville

This title introduces a summary report on what is described as "one of the most intensive studies to date of the nature and causes of air pollution," made in Louisville and Jefferson County, Ky., in 1956 and 1957. Popular concern over the increasing amount of air pollution over Louisville led to the survey under the technical direction of the Robert A.

Taft Sanitary Engineering Center, Public Health Service. The nature of the problem, the method for conducting the survey, the findings of the survey, the meaning and recommendations make up the report. The cooperative study, including the assistance of several local organizations of which both the city-county and state health departments were participants, was aided by the United States Departments of Commerce and the Interior. A more detailed technical report will be available later. Community Air Pollution Programs, U. S. Public Health Service, 4676 Columbia Parkway, Cincinnati 26, Ohio.

Are Scholarships the Answer?

"A large Federal program of, say, 40,000 scholarships would probably have as its major effect discouraging existing private and state efforts and would not significantly help able students not already being helped . . . it will have as a main effect concentrating in making it possible for high tuition colleges to raise their tuitions higher." This is the conclusion of John R. Stalnaker, president, National Merit Scholarship Corporation, speaking for himself before a Subcommittee of the House Committee on Education and Labor on proposed federal education programs.

In support of his point of view, Dr. Stalnaker cited a sampling study among 15,000 top students identified by the Merit Corporation. On the basis of the sample it was found that, without a federal scholarship program, more than 90 per cent of these were in college.

A Variety of Fellowships

Cerebral Palsy Fellowships

United Cerebral Palsy has inaugurated three new fellowship programs—clinical fellowships in cerebral palsy for physicians and dentists, postdoctoral fellowships in brain research, and medical student fellowships in cerebral palsy. For funds to become available on July 1, 1959, the filing deadline date is March 15, 1959. At the same time the Board of Directors has broadened its grant program. Its concept of research now includes "support of basic and clinical studies encompassing the entire spectrum of brain damage and the consequences thereof."

Leaflets explaining the policies and procedures of the grant program and the three new fellowship programs, application blanks, and further information are available from the director of research, Dr. Brewster Miller, United Cerebral Palsy Research and Educational Foundation, 321 W. 44th St., New York 36.

National Foundation Fellowships

December 1 is the announced deadline date for postdoctoral fellowship in research and academic medicine or in the clinical fields of rehabilitation, orthopedics, and preventive medicine offered by the National Foundation for consideration in February, 1959. The research or academic medicine fellowships are available only to applicants with an M.D., Ph.D., or equivalent degree, those in the clinical fields only to physicians. Annual stipends range from $3,600–$6,000 in addition to compensation to the institution of study.

Fellowships are also available for personnel in physical therapy and occupational therapy teaching and for physical therapy travelships. For the former, monthly stipends range from $200 to $350.

Full details, applications, and information on scholarships for basic education in physical therapy and medical social work and fellowships for short courses in the care of the polio patient from Division of Professional Education, National Foundation, 301 East 42nd Street, New York 17, N. Y.

Whitney Opportunity Fellowships

The John Hay Whitney Foundation has announced its 1959–1960 Opportunity Fellowships "to give opportunity for special experience or advanced study to outstanding individuals who might not otherwise be able to reach their fullest development." Citizens who have given evidence of special ability and have not had full opportunity to develop their talents because of arbitrary barriers are eligible. They should be "young enough to have their careers before them" and "mature enough to have given positive evidence of superior promise." Awards for the year range from $1,000 to $3,000. In the past they have been given to Negroes, Spanish-American, Chinese- and Japanese-Americans, American Indians, and residents of Puerto Rico, territories, trust territories, and the Appalachian mountain area.

Annual stipends range from $1,000 to $3,000 depending on individual circumstances. Deadline date for applications is November 30, 1958, and awards will be announced in April, 1959. Here is a resource for a public health "opportunity" fellowship.

Application forms and further information from Opportunity Fellowships, John Hay Whitney Foundation, 630 Fifth Ave., New York 20.

Graduate Fellowships for Women

The American Association of University Women announces the availability of some 40 national fellowships with stipends ranging from $2,000 to $3,500 annually. These fellowships are open to American women who show promise of distinction for advanced study or research, in general to candidates who have already received the doctorate. Thus there is a possibility for research in the field of public health for a candidate with a "significant" project and evidence of ability to pursue it and showing "promise of distinction in her field of study."

Applications for the academic year 1959–1960 must be received not later than December 1, 1958. A leaflet giving full details is available from the Secretary, Committee on Fellowship Awards, 1635 Eye St., N.W., Washington 6, D. C.

PERSONALS

DONALD R. BENSON, associate sanitary engineer, Oregon State Board of Health, who recently received a master of science degree at the Harvard University Graduate School of Engineering, has been awarded the 1957–1958 Herschel Clemens Award. This is the fourth time in the last five years that a sanitary engineer from the State Board of Health has won this honor.

DANIEL BLAIN, M.D.,† former medical director, the American Psychiatric Association, is now director, Mental Health Training and Research Project, Western Interstate Commission for Higher Education, with headquarters at the University of Colorado, Boulder.

FLOYD S. DAFT, Ph.D.,† director, National Institute of Arthritis and Metabolic Diseases, Public Health Service, was moderator of a symposium on "Germ-Free Animals," one of six symposiums at the 1958 International Congress for Microbiology at the Royal Institute of Technology, Stockholm, August 4–9.

BETH DUNCAN, M.P.H.,† former senior nutritionist, North Carolina State Board of Health, is now associate professor of nutrition, University of Tennessee College of Home Economics, Knoxville.

HERMAN L. FELLTON,* president of Getz Exterminators, is national chairman of the 25th Anniversary Convention, National Pest Control Association, being held in Washington, D. C., in October.

WILLIAM BRYAN FRENCH, M.S. (public health education), has been appointed chief, Bureau of School Health, Illinois State Department of Public Health, succeeding PEARL BAYNE, R.N.,† resigned.

JACK J. GOLDMAN, M.D., M.P.H.,† deputy health commissioner, Westchester County Department of Health (N.Y.), has been promoted to first deputy commissioner of health, succeeding THEODORE H. DRACHMAN, M.D.,

* Fellow.
† Member.

M.S.P.H.,* resigned to become health commissioner, Columbia County.

VERNE K. HARVEY, M.D., M.P.H.,† former professional services director, VA Hospital, Indianapolis, is now director, Division of Maternal and Child Health, Indiana State Department of Health, Indianapolis.

MORTIMER B. HELLER, M.Sc. (hygiene), former health physicist, Brookhaven National Laboratory, is now the health physicist, Radiological Safety Service, University of Pittsburgh.

ROBERT B. HOWARD, M.D., former professor of medicine and recently associate dean, is now dean, College of Medical Sciences, University of Minnesota. He succeeds HAROLD S. DIEHL, M.D., Sc.D.,* retired, and now senior vice-president for research and medical affairs, American Cancer Society.

LAVETA V. JUDY, R.N.,* formerly with Division of Public Health, Health and Hospital Corporation of Marion County (Ind.), is associate professor, Department of Nursing, Vincennes University.

MARTIN D. KELLER, M.D., M.P.H.,† formerly with Epidemic Intelligence Service, Public Health Service, has been named chief of the Divisions of Chronic Diseases and Tuberculosis, Ohio State Department of Health.

NORVIN C. KIEFER, M.D., M.P.H.,* chief medical director, Equitable Life Assurance Society of the United States, has been elected to the Board of Directors, National Council on Alcoholism.

MARGARET E. KILLEEN, former specialist in community organization, New York City Housing Authority, is a new field consultant for the Midwest Region, Committee on Careers, National League for Nursing.

MAURICE LEBOSQUET, JR.,† former assistant chief, Water Supply and Water Pollution Control Program for Interagency Activities, Public Health Service, has been assigned to the International Cooperation Administration as chief sanitary engineer, Technical Cooperation Mission to India, New Delhi.

BERWYN F. MATTISON, M.D., M.P.H.,* executive secretary, American Public Health Association, has been elected to the Board of Directors, National Council on Alcoholism.

JEAN H. MENETREZ, M.D., formerly with the Washington Institute of Mental Hygiene, has been appointed acting chief, Alcoholic Rehabilitation Division, Department of Health, District of Columbia, Washington, D. C., succeeding ELEANOR E. SHORT, M.D., named assistant chief, Adult Mental Health Division.

IRVING MILLMAN, Ph.D., former assistant professor, Department of Microbiology, Northwestern University, is now associate bacteriologist, Public Health Research Institute of New York City.

F. W. MONTANARI, M.C.E.,* staff sanitary engineer, Ohio River Valley Water Sanitation Commission, Cincinnati, has been elected secretary-general of the Inter-American Association of Sanitary Engineering (AIDIS).

MARY F. QUARMBY, R.N., former instructor in psychiatric nursing, New York State University, is a new assistant director, Department of Baccalaureate and Higher Degree Programs, National League for Nursing.

CLARK RICHARDSON, M.D., M.P.H.,† acting medical director, Los Angeles Health Department, will sail in November for six months in the South Pacific aboard the schooner, "Yankee." The medical director, DEWITTE T. BOYD, M.D., M.P.H., has returned from the University of California School of Public Health.

DOROTHY RUSBY, R.N.,* former assistant director, Department of Public Health Nursing, National League for Nursing, is now director, Visiting Nurse Association, Cleveland, Ohio.

MARION F. RUSSELL, M.S.,† former professor of medical social service, and director, Social Service Department, Vanderbilt University Hospital, has been appointed director, Social Service Department, and assistant to the chief, Division of Social Medicine, Montefiore Hospital, New York City.

WILLIAM H. STEWART, M.D.,* former assistant program operations officer, is chief of the Division of Public Health Methods, Public Health Service, succeeding GEORGE ST. J. PERROTT,* retired.

CHESTER A. SWINYARD, M.D., former medical director, Rehabilitation Center, University of Utah College of Medicine, has been appointed associate director, Children's Division, New York University-Bellevue Medical Center's Institute of Physical Medicine and Rehabilitation, and research consultant, Association for the Aid of Crippled Children, which helped to develop the Children's Division.

HARRY WRIGHT, M.D., former practicing physician, has been appointed medical director of the Massac, Johnson, Pope, and Hardin Counties Health Department, Golconda, Ill.

DEATHS

GRAHAM L. DAVIS,* hospital consultant, W. K. Kellogg Foundation, Battle Creek, Mich.,

* Fellow.
† Member.

from 1940 to 1951, died on July 4 from automobile accident injuries (Medical Care Section).

NEVA R. DEARDORFF, Ph.D.,† statistical expert in social welfare and health work for more than forty years, on August 21 (Statistical Section).

THOMAS R. DONOGHUE,† director of safety, Pittsburgh Plate Glass Company, Pittsburgh, Pa. (Occupational Health Section).

THOMAS McC. MABON, M.D.,* professor of hygiene and preventive medicine and associate professor of medicine, University of Pittsburgh, Pittsburgh, Pa. (Medical Care Section).

ALLEN A. C. NICKEL, M.D.,† of Bluffton, Ind. (Laboratory Section).

M. MARGARET O'NEAL, M.D., M.P.H.,* health commissioner, Muskingum County General Health District (Ohio) (Health Officers Section).

BLAIR POINTS, M.D.,* of Oklahoma City, Okla., on February 10, 1958 (Health Officers Section).

WINSTON H. TUCKER, M.D., PH.D.,* commissioner of health and director of public housing of Evanston, Ill., on August 3 (Health Officers Section).

J. L. TURNAGE, M.D.,† Oklaloosa (Fla.) County Health Department, on March 19 (Health Officers Section).

CONFERENCES AND DATES

American Public Health Association, 86th Annual Meeting, St. Louis, Mo., Headquarters: Kiel Auditorium, October 27–31, and Related Organizations.

State and Regional Public Health Meetings:

California, Southern, Public Health Association. Huntington-Sheraton Hotel, Pasadena. December 5.

Connecticut Public Health Association. Newington Home and Hospital for Crippled Children. Newington, Conn. November 13.

Florida Public Health Association. George Washington Hotel, West Palm Beach, October 2–4.

Mississippi Public Health Association. Hotel Robert E. Lee, Jackson. December 3–5.

Oregon Public Health Association. Multnomah County Health Department. October 30–31.

Tennessee Public Health Association. Maxwell House Hotel, Nashville. October 1–3.

Washington State Public Health Association. Chinook Hotel, Yakima. October 26–28.

Meetings of Other Organizations Coming in October, November, and December:

American Academy of Pediatrics. Palmer House, Chicago, Ill. October 20–23.

American Association of Medical Record Librarians. Boston, Mass. October 13–16.

American Cancer Society, Inc. Annual Scientific Session. Biltmore Hotel, New York, N. Y. October 20–21.

American Dental Association. Dallas, Tex. November 10–13.

American Dietetic Association. Philadelphia, Pa. October 21–24.

American Heart Association. San Francisco, Calif. October 25–31.

American Society of Tropical Medicine and Hygiene. Deauville Hotel, Miami Beach, Fla. November 5–8.

Cuban National Dental Congress (Fifth). Havana, Cuba. November 14–17.

Federation of Sewage and Industrial Wastes Associations. Sheraton-Cadillac Hotel, Detroit, Mich. October 6–9.

International Conference of Social Work (Ninth). Tokyo, Japan. November 30–December 6.

International Congress of Leprology (Seventh). Sankei Kaikan Building, Tokyo, Japan. November 12–19.

National Association for Retarded Children. Philadelphia, Pa. October 8–11.

National Conference on Air Pollution, Called by the Surgeon General of the Public Health Service. Sheraton-Park Hotel, Washington, D. C. November 18–20.

National Safety Congress. Conrad Hilton Hotel, Chicago, Ill. October 20–24.

National Society for Crippled Children and Adults. Statler Hilton Hotel, Dallas, Tex. November 16–20.

National Social Welfare Assembly. New York, N. Y. December 9–10.

Planned Parenthood Federation of America. Roosevelt Hotel, New York, N. Y. October 14–16.

* Fellow.
† Member.

WILEY BOOKS

Just out! A fresh approach to the problem of

ENVIRONMENTAL SANITATION

By JOSEPH A. SALVATO, JR., MCE, PE, Rensselaer County Health Dept., New York

Emphasizes the practical application of sanitary and public health engineering theory and principles to the smaller community, installation, or facility of less than 1000 to 5000 persons. Empirical formulas, rules of thumb, and sound judgment are also used to illustrate how the best possible job can be accomplished under particular circumstances. Included are discussions on planning, design, construction, maintenance, and operation details as well as administration of environmental sanitation activities. 1958. 660 pages. Illus. $12.00.

Teamwork as the key to success . . .

REHABILITATION

A Community Challenge

By W. SCOTT ALLAN, Supervisor of Medical Services, Liberty Mutual Insurance Company

Provides professional guidance to every agency concerned with rehabilitation. Covers such practical information as: simple budgets; staffing patterns; cost experience; the effects of social legislation, workman's compensation, and prepaid health insurance on the ultimate productivity of the injured person. Technical discussions of therapy, restoration, and counseling are included. 1958. 247 pages. Illus. $5.75.

Send this coupon TODAY for ON-APPROVAL copies of these useful books!

JOHN WILEY & SONS, Inc. AJPH-108
440 Fourth Ave., New York 16, N. Y.

Please send me a copy of the book(s) checked below to read and examine ON APPROVAL. Within 10 days I will either return the book(s) and owe nothing, or I will remit the full purchase price(s), plus postage.

☐ ENVIRONMENTAL SANITATION $12.00

☐ REHABILITATION .....$ 5.75

Name .....

Address .....

City ..... Zone .... State .....

☐ SAVE POSTAGE! Check here if you ENCLOSE payment, in which case we will pay postage. Same return privilege, of course.

YOU see better!
FINGER DEPRESSION FACILITATES CONTROL.
REINFORCING FILLET IN CENTER SECTION.
TWO-BEND DESIGN ELIMINATES OBSTRUCTED VISION.
CONVEX END OF BLADE CONFORMS TO TONGUE STRUCTURE
OWD Riteshape Tongue Blade is more than a piece of wood—it is an instrument. You need its advanced features. Tell your nurse to order it from your local supply house, or write for a free sample carton.
O.W.D.
Riteshape
TONGUE BLADE
Made only by OVAL WOOD DISH CORPORATION
TUPPER LAKE, N. Y.
GRAYBAR BLDG. NEW YORK CITY • 506 SO. WABASH AVE. CHICAGO

Preserve your JOURNALS

With a *Jesse Jones* Volume File

Specially designed and produced for the American Journal of Public Health, this file will keep one volume, or 12 issues, clean, orderly and readily accessible. Picture this distinctive, sturdy Volume File on your book shelf. Its rich red and green Kiver cover looks and feels like leather, and the 16-carat gold leaf hot-embossed lettering makes it a fit companion for your finest bindings.

The Volume File is reasonably priced, in spite of its costly appearance. It is sent postpaid (except in Canada and in foreign countries) carefully packed, for $2.50 each. Most members will find it more convenient and economical to order 3 for $7.00 or 6 for $13.00. Satisfaction guaranteed. For prompt shipment, order direct from the:

American Public Health Association
1790 Broadway, New York 19, N. Y.

The American Public Health Association acknowledges with deep appreciation its indebtedness to these Sustaining Members whose annual dues help support its general program

Sustaining Members

Amalgamated Laundry Workers Health Center, Inc., New York, N. Y.
Amalgamated Meat Cutters and Butcher Workmen of North America, Chicago, Ill.
American Bottlers of Carbonated Beverages, Washington, D. C.
American Can Company, New York, N. Y.
American Federation of Labor and Congress of Industrial Organizations, Washington, D. C.
Association for the Aid of Crippled Children, New York, N. Y.
Beth Israel Hospital, Boston, Mass.
Borden Company, New York, N. Y.
Chicago Office, Theatre, and Amusement Building Janitors' Union, Local 25, Chicago, Ill.
Chlorine Institute, Inc., New York, N. Y.
Department of Nursing, University of Miami, Coral Gables, Fla.
Difco Laboratories, Detroit, Mich.
Diversey Corporation, Chicago, Ill.
Equitable Life Assurance Society of the United States, New York, N. Y.
Grand Concourse Medical Group, New York, N. Y.
Harold Faggen Associates, New York, N. Y.
Health Insurance Plan of Greater New York, New York, N. Y.
Hellige, Inc., Garden City, N. Y.
Hoffmann-LaRoche, Inc., Nutley, N. J.
International Association of Ice Cream Manufacturers, Washington, D. C.
International Association of Machinists, Washington, D. C.
International Equipment Company, Boston, Mass.
International Union, UAW, Detroit, Mich.
Jamaica Medical Group, Jamaica, N. Y.
John Hancock Mutual Life Insurance Company, Boston, Mass.
Lederle Laboratories Division, American Cyanamid Co., New York, N. Y.
Licensed Beverage Industries, Inc., New York, N. Y.
Life Insurance Company of Virginia, Richmond, Va.
Merck Sharp & Dohme, Research Laboratories, Division of Merck & Co., Inc., Rahway, N. J.
Metropolitan Life Insurance Company, New York, N. Y.
Montefiore Hospital Medical Group, New York, N. Y.
National Association of Social Workers, Medical Social Work Section, New York, N. Y.
National Dairy Products Corporation, New York, N. Y.
New York Hotel Trades Council and Hotel Association Health Center, Inc., New York, N. Y.
Oval Wood Dish Corp., Tupper Lake, N. Y.
Owens-Illinois Glass Company, Libbey Glass Division, Toledo, Ohio
The Proctor & Gamble Company, Cincinnati, Ohio
Prudential Insurance Company of America, Newark, N. J.
Rip Van Winkle Clinic, Hudson, N. Y.
Ross Laboratories, Columbus, Ohio
Ross-Loos Medical Group, Los Angeles, Calif.
Sealright Company, Inc., Fulton, N. Y.
Martin E. Segal & Company, Inc., New York, N. Y.
Sidney Hillman Health Center, New York, N. Y.
Sodiphene Company, Kansas City, Mo.
E. R. Squibb and Sons, New York, N. Y.
Steiner Sales Company, Chicago, Ill.
Sun Life Insurance Company, Baltimore, Md.
Union Central Life Insurance Company, Cincinnati, Ohio
Upjohn Company, Kalamazoo, Mich.
Winthrop Laboratories, Inc., New York, N. Y.
Wyeth Laboratories, Inc., Philadelphia, Pa.

Why Over 3,500 TB Case-Finding Projects Annually Use

POWERS X-RAY SERVICE

- **POWERS SERVICE IS COMPLETE!** Powers relieves project sponsors of *all* technical problems. Our experienced technicians work to the sponsor's schedule, with units able to take as many as 200 chest x-rays an hour. We deliver fully processed x-rays, with a viewer, to sponsor's roentgenologist.
- **LOWER IN COST!** The large volume of x-rays Powers handles nationally enables us to cut overhead costs to a minimum for each individual project.
- **EFFICIENT!** Our 20 years of experience in chest x-ray surveys from Maine to Texas have taught us to do the job quickly and effectively under many diverse conditions.
- **FLEXIBLE!** According to the sponsor's requirements, Powers offers either the full-size roll paper method or the 70 mm photofluorographic method – and operates either portable units or mobile units with generators.

Reg. T. M. POWERS X-RAY PRODUCTS

Our technical advisory service is available without obligation. Write before you plan a TB Case-Finding Project!

POWERS X-RAY PRODUCTS, INC.

Group Radiography

GLEN COVE LONG ISLAND N. Y.

Directory of Health Service

BLACK & VEATCH

Consulting Engineers

Water — Sewage — Electricity — Industry

Reports, Designs, Supervision of Construction, Investigations, Valuation and Rates.

1500 Meadow Lake Parkway, Kansas City 14, Mo.

T P I

(Treponema Pallidum Immobilization Test)

Information on fees, and on collection and submission of specimens furnished upon request

THE DICKMAN LABORATORIES

ALBERT DICKMAN, Ph.D.

128 S. Seventeenth Street, P.O. Box 2091
Philadelphia 3, Pa.

ROY B. EVERSON

Water Treatment Service since 1900 for Swimming Pool Circulating Systems. Purification Systems as applied to Sewage Treatment and Water Works. A New System for Automatic Control.

215 W. HURON ST. CHICAGO 10, ILL.

EMERSON VENABLE, P. E.

Chemist and Chemical Engineer

Atmospheric Pollution.

Industrial Hygiene Chemical Warfare

6111 Fifth Ave., Pittsburgh 32, Pa.

PROFESSIONAL EXAMINATION SERVICE

A Personnel Administration Service in the Field of Public Health

Available to State and Local Health Departments and Merit Systems

Examinations Field Consultation

American Public Health Association, Inc.
1790 Broadway, New York 19, N. Y.

effective, practical!

MUMPS VACCINE

A specific immunizing antigen (chick embryo origin) for prevention or modification of mumps in children and adults.

LEDERLE LABORATORIES DIVISION
AMERICAN CYANAMID COMPANY
PEARL RIVER, N. Y.

LAMOTTE UNIT FOR INSPECTION OF FOOD STUFFS

Developed in cooperation with Ferdinand A. Korff of the Baltimore City Health Dept.

Contains tests for determining

pH	Fluoride
Ammonia	Sulfite
Cyanide	Dye
Chlorine	Rodent Urine

Quaternary Ammonium Solutions

Furnished in a small hinged case which will readily fit in a brief case. Complete with instructions.

Send for literature on this item.

LaMotte Chemical Products Company

Dept. PH Chestertown, Md., USA

AMERICAN PUBLIC HEALTH ASSOCIATION, Inc.
1790 Broadway New York 19, N. Y.

APPLICATION FOR MEMBERSHIP

(Please type or print)

NAME_____

MAILING ADDRESS_____
(street) (city) (zone) (state)

PRESENT POSITION_____
(title) (organization)

BUSINESS ADDRESS_____
(street) (city) (zone) (state)

PRIOR EXPERIENCE_____
(title) (organization) (city and state) (dates)

PLACE AND DATE OF BIRTH_____

EDUCATION (schools, dates, degrees if any)_____

PROFESSIONAL SOCIETY MEMBERSHIPS_____

Please complete application on reverse side

REPORTS OF THE COMMITTEE ON PROFESSIONAL EDUCATION

(Officially Approved by the Governing Council of the A.P.H.A.)

Educational and Experience Qualifications of Administrative Personnel (Non-Medical) in Public Health Agencies
Educational and Experience Qualifications of Physical Therapists in Public Health Agencies
Educational Qualifications of Industrial Hygiene Personnel Other Than Medical, Dental, and Nursing
Educational and Experience Qualifications of Public Health Laboratory Workers
Educational Qualifications and Functions of Public Health Educators
Educational Qualifications of Directors of Public Health Departments
Educational Qualifications of Medical Administrators of Specialized Health Activities
Educational Qualifications of Medical Social Workers in Public Health Programs
Educational Qualifications of Nutritionists in Health Agencies
Educational Qualifications of Public Health Dental Hygienists
Educational Qualifications of Public Health Dentists
Educational Qualifications of Sanitary Engineers Engaged in the Field of Public Health
Educational Qualifications of Public Health Statisticians
Educational Qualifications of Public Health Veterinarians
Educational Qualifications of School Physicians
Educational and Other Qualifications of Public Health Sanitarians

Single copies are available without charge

Address requests to the

Book Service

AMERICAN PUBLIC HEALTH ASSOCIATION, Inc.

1790 Broadway at 58th Street New York 19, N. Y.

(Continued from previous page)

SECTION AFFILIATION DESIRED (choose only one)

_____Health Officers	_____Food and Nutrition	_____School Health
_____Laboratory	_____Maternal and Child Health	_____Dental Health
_____Statistics	_____Public Health Education	_____Medical Care
_____Engineering and Sanitation	_____Public Health Nursing	_____Mental Health
_____Occupational Health	_____Epidemiology	_____Unaffiliated

ENDORSER: The endorser of this application must be a Member or Fellow of the American Public Health Association. If you cannot obtain the actual signature, print the name and address so that the Administrative Office may procure it for you.

_____ _____
(signature) (address)

ANNUAL DUES: United States $12.00; elsewhere $13.00 to cover postage. The dues cover use of the services maintained by the Association and monthly receipt of the American Journal of Public Health.

The membership year is January through December. Members joining during the first six months of the year will receive the Journal from January through December. Members joining after July 1 will receive the Journal beginning with July; such applicants may pay one year's dues covering the period July through June, or one-and-a-half year's dues, thus adjusting dues to the membership calendar year.

Dues must be received before applications are reviewed by the Committee on Eligibility.

A remittance for $_____is enclosed. Send bill to_____

DATE_____SIGNATURE_____

gentle motivation to encourage normal elimination

Sal Hepatica®

LAXATIVE WITH ANTACID

speedy, gentle relief for constipation and excess acidity

Dependable—Draws water into intestines by osmosis, creating moist bulk and gentle pressure to initiate proper intestinal response.

ANOTHER FINE PRODUCT OF BRISTOL-MYERS

FREE!

TO NURSES

REGULAR SIZE **A-200** Pyrinate

HARMLESS TO PATIENTS

KILLS head, crab and body **LICE** and their eggs **ON CONTACT!**

Speedy! Results proven under the most carefully controlled clinical tests. A-200 Pyrinate took only minutes to kill both parasites and eggs—without any allergic manifestations. One application does the job.

Easy! Liquid A-200 lathers like a shampoo. Washes off with warm water. No messy salve, no tell-tale odor.

Safe! Non-poisonous.

FREE TRIAL! Prove its effectiveness on your patients—at our expense!

FREE from

CODE # 10-A

McKESSON Laboratories
Fairfield, Connecticut

Rush me one regular size package of A-200 Pyrinate FREE.

NAME

ADDRESS

CITY STATE

AMERICAN PUBLIC HEALTH ASSOCIATION, Inc.

1790 Broadway at 58th Street — New York 19, N. Y.

Publications of the APHA

American Journal of Public Health and the Nation's Health. Single copies..... $1.25

APHA Year Book..... $1.50

An Appraisal Method for Measuring the Quality of Housing: A Yardstick for Health Officers, Housing Officials and Planners:

Part I. Nature and Uses of the Method. 1945. 71 pp. $1.00

Part II. Appraisal of Dwelling Conditions. Vol. A—Director's Manual. $3.00. Vol. B—Field Procedures. $2.00. Vol. C—Office Procedures. $2.00. 1946; or three for..... $6.00

Part III. Appraisal of Neighborhood Environment. 1950. 152 pp. $3.00

Basic Principles of Healthful Housing. 2nd ed. reprinted 1950. 34 pp. $1.00

Baker's Devonshire Colic. 1767. Facsimile Delta Omega ed., 1950. 74 pp..... $5.00

Care of Laboratory Animals. 1954. 32 pp. ..... .75

Control of Communicable Diseases in Man. 8th ed. 1955. 219 pp..... .60

Diagnostic Procedures and Reagents. Technics for the Laboratory Diagnosis and Control of the Communicable Diseases. 3rd ed. 1950. 589 pp. $6.00

Diagnostic Procedures for Virus and Rickettsial Diseases. 2nd ed. 1956. 578 pp. $7.50

Directory of Public Health Statisticians. 6th ed. 1958. 50 pp. $1.50
Special price to members on prepaid orders only.. $1.00

Evaluation Schedule. For use in the study and appraisal of community health programs ..... .70

General Medical Care Programs in Local Health Departments. 1951. 129 pp. $1.00

Guide to a Community Health Study. Revised 1955. 64 pp. $1.00

Guides to Services for Handicapped Children: 1955.

Cerebral Palsy—108 pp. $1.50
Cleft Lip and Cleft Palate—84 pp. $1.50
Dentofacial Handicaps—68 pp. $1.50
Epilepsy—1958. 124 pp. $1.50
Handicapped Children—170 pp. $1.50
Hearing Impairment—1956. 124 pp. $1.50
Vision and Eye Problems—1956. 112 pp. $1.50

Health Practice Indices 1947–1948. A collection of charts showing the range of accomplishments in various fields of community health service. 90 pp. $1.00

Health Supervision of Young Children. 180 pp. .. $3.00

Housing an Aging Population. 1953. 92 pp. $1.50

Methods for Determining Lead in Air and in Biological Materials. 2nd ed. 1955. 69 pp. $1.25

Nutrition Practices: A Guide for Public Health Administrators. 72 pp. $1.00

Occupational Lead Exposure and Lead Poisoning. 1953. 67 pp. ..... .50

Panum on Measles. By P. L. Panum (Translation from the Danish). Delta Omega ed., 1940. 111 pp. $2.50

Principles for Healthful Rural Housing. 1st ed. 1957. 29 pp. $1.00

Proposed Housing Ordinance. 1953. 24 pp. $1.00

Public Exposure to Ionizing Radiations. What Public Health Personnel Needs to Know. 1958. 55 pp. $1.35

Public Health Career Pamphlets:

Public Health—A Career with a Future. Revised edition. 1954 ..... .25

Recommended Methods for the Microbiological Examination of Foods. 1958. 207 pp..... $4.50

Selected Papers of Joseph W. Mountin, M.D. 1956. 336 pp. $5.00

Shattuck Report, The. Report of the Sanitary Commission of Massachusetts: 1850. 321 pp. $4.50

Standard Methods for the Examination of Dairy Products. 10th ed., 1953. 345 pp. $5.50

Microbiological Examination of Milk and Cream: Chapter 2 only. 61 pp. ..... .75

Photographic Sediment Charts..... $1.75

Standard Methods for the Examination of Water, Sewage and Industrial Wastes. 10th ed. 1955. 522 pp. $7.50
Special price to members of APHA, AWWA, and FSIWA on prepaid orders only for a single copy.. $6.50

Standards for Healthful Housing:

Planning the Home for Occupancy. 1950. 56 pp... $2.00
Construction and Equipment of the Home. 1951. 77 pp. $2.00

Swimming Pools and Other Public Bathing Places. Recommended Practice for Design, Equipment and Operation of. 10th ed., 1957. 60 pp. .. $1.00

35 Year Index of the American Journal of Public Health. Years 1911 to 1945. 340 pp. Buckram ed. $7.00. Paper ed. $3.75

Order from the Book Service — Advance Payment Is Requested

Reprints from the American Journal of Public Health

Bacterial Cleanability of Various Types of Eating Surfaces. February, 1953. 12 pp. ..... .25

Bookshelf on Epidemiology and Evaluation, The Medical Officer's. April, 1957. 16 pp. ..... .35

Bookshelf on Foods and Nutrition. April, 1955. 12 pp. ..... .25

Bookshelf on International Health. April, 1958. 12 pp. ..... .25

Certain Aspects of the Microbiology of Frozen Concentrated Orange Juice. June, 1956. 8 pp. .. .10

Creative Health and the Principle of Habeas Mentum. February, 1956. 12 pp. ..... .25

Driver Behavior and Accidents. May, 1957. 8 pp. .10

Givers' Dilemma. Editorial. October, 1954. 4 pp. Free

Lemuel Shattuck—Still a Prophet. February, 1949. 27 pp. ..... .25

The Local Health Department—Services and Responsibilities. An official statement of the American Public Health Association. March, 1951. 8 pp. .10

On the Use of Sampling in the Field of Public Health. June, 1954. 24 pp. ..... .40

Poultry Inspection. Official Statement of APHA. November, 1957. 12 pp. ..... .50

Public Health Problem of Accidental Poisonings. August, 1936. 8 pp. ..... .10

State Health Department—Services and Responsibilities. February, 1954. 20 pp. ..... .35

Suggested Home Accident Prevention Activities for Health Departments. May, 1956. 8 pp. .... .10

Tax-Supported Health and Welfare Services. January, 1957. 8 pp. ..... .15

Tax-Supported Medical Care for the Needy. October, 1952. 20 pp. ..... .10

Order from the Book Service — Advance Payment Is Requested

keep milk fresh to the last drop

• From dairy to consumer these modern, practical closures completely seal the bottle mouth. On the capping line, and during delivery, hands never touch the pouring lip.

In the home, this cleanliness and sure protection continues. Seal-Hood and Seal-Kap closures snap tightly back on after each use, keeping milk at the peak of freshness and purity until the bottle is empty. And because both cap and seal are combined in one unit, users enjoy far easier handling than with ordinary caps.

Capping with Seal-Hood and Seal-Kap is a *single operation* process. Naturally, dairymen benefit from sizable savings in milk loss, time and maintenance costs . . . because no separate hooder is needed.

AMERICAN SEAL-KAP CORP.
11-05 44th Drive
Long Island City 1, N. Y.

IODINE SANITIZERS

OFFER ALL THESE ADVANTAGES

A LONG RECORD OF DEPENDABILITY. Iodine is recognized as a most efficient antiseptic and germicide. It is known to be effective against a wide range of organisms. New technology has now resulted in more efficient iodine formulations developed especially for sanitization.

SPECIALIZED PRODUCTS. Iodine sanitizers and detergent-sanitizers are offered by leading manufacturers for treatment of milk, food and beverage utensils and equipment. Also available are iodine disinfectant-cleaners for hospitals, schools, institutions, food and beverage plants, and industrial applications.

EFFECTIVE. Iodine sanitizers are effective in low concentrations . . . economical, too. Their use can contribute to improved public health.

EASY TO TEST. The well-known iodine color is an indication of solution strength. When the color of an iodine sanitizing solution begins to disappear, that is a signal to replenish or replace the solution. There is no reason ever to let an iodine solution get too weak to be effective. Test kits are available.

Write us for further information and names of manufacturers offering iodine sanitizers and disinfectant-cleaners in your area. No obligation, of course.

CHILEAN IODINE EDUCATIONAL BUREAU, INC.

Room 2158, 120 Broadway, New York 5, N. Y.

Visit the Chilean Iodine Exhibit at the APHA meeting in St. Louis.

Microbiological Examination of Foods

Public health laboratory personnel now have an up to date, authoritative manual in *Recommended Methods for the Microbiological Examination of Foods* to guide them in routine and special examinations of foods and food products. Each chapter has been prepared by experts and reviewed by others. The methods have also stood the critical examination of leading public health laboratory directors.

Starting with methods developed by committees of the Food and Nutrition Section, the volume has been prepared by the Subcommittee on Methods for the Microbiological Examination of Foods. Harry E. Goresline, Ph.D., has been chairman of the Subcommittee and served as editor of the volume. The report has been approved for publication by the Committee on Evaluation and Standards. Each chapter considers methods for related food products. These are:

Bottled Soft Drinks
Brined Salted & Pickled Vegetable Products
Canned Foods
Carbohydrate Products
Cereals and Cereal Products
Dehydrated Fruits & Vegetables
Eggs & Egg Products
Fermented Foods
Fruit Juices and Concentrates
Frozen Fruits, Vegetables & Precooked Frozen Foods
Mayonnaise, Salad & French Dressings
Meat and Meat Products
Poultry Meat
Spices
Sanitation Indexes
Detection & Enumeration of Food Poisoning Types of Microorganisms

Culture Media
Stains
Reagents and Indicators

A preface has been written by Ferdinand R. Hassler, M.D., Chairman of the Coordinating Committee on Laboratory Methods.

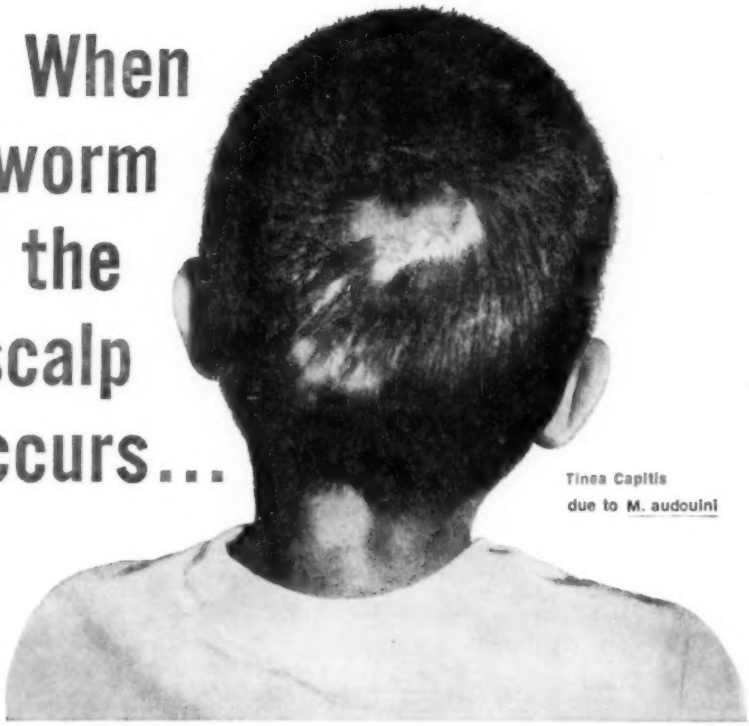
212 pages $4.50

1958

THE AMERICAN PUBLIC HEALTH ASSOCIATION 1872

AMERICAN PUBLIC HEALTH ASSOCIATION INC.
1790 Broadway New York 19, N. Y.

When ringworm of the scalp occurs...



Tinea Capitis
due to M. audouini

. . . topical antifungal therapy is recommended as immediate treatment. Prompt use of Salundek will destroy accessible spores and form a protective coating, reducing the likelihood of spread of the disease to other areas of the scalp, or to other children.

*New Dosage Form, Salundek Solution** – It is supplied in 3-ounce bottles with a controlled flow applicator cap. Now there is a choice that will lead to better patient cooperation during the treatment of this stubborn disease.

Many investigators have reported that the ointment and the solution have the same high percentage of cures, obtained in an average of 12 to 16 weeks.

Salundek also eliminates the hazard of x-ray therapy • seldom causes skin reaction • offers convenience in use – no stain, no odor and no effect on future hair growth.

Supplied: SALUNDEK OINTMENT, 2 oz. tubes and 1 lb. jars. SALUNDEK SOLUTION, 3 oz. bottles with controlled flow applicator cap.

Write for supply of "Instructions for Home Care" pads.

SALUNDEK® OINTMENT / SOLUTION

(Brand of Zinchlorundesal)

Maltbie

MALTBIE LABORATORIES DIVISION • Wallace & Tiernan Incorporated • Belleville 9, N. J.

*In the presence of open lesions, the use of the ointment may be preferred at first since the base of the solution causes occasional transient stinging. Avoid contact with the eyes.

DIFCO

Antisera and Antigens

Enteropathogenic Coli Klebsiella

Salmonella Shigella

Brucella Leptospira Streptococci

*

C Protein Antiserum and Standard

*

Infectious Mononucleosis Antigens and Standards

Potent

Stable

Specific

Descriptive literature available on request

Specify

DIFCO LABORATORY PRODUCTS

BIOLOGICS CULTURE MEDIA REAGENTS